

A N
EPITOME
Of the Whole
Art of War.


IN TWO PARTS.

The First of Military Discipline, Containing the whole Exercise of the Pike and Musquet, &c. with plain Directions for the various Postures. Also the Drawing up of Battalions, and way of Forming them; with the Art of Doubling, Wheeling, Forming, and Drawing up an Army into any Figure. The way of Conducting Armies in Hilly, Woody or Plain Countries: Of Encampings, Besiegings, giving of Battle, &c.

The Second of Fortification and Gunnery, which shews the Principles and Practice of Fortification, as now used, as well by the English, as several other European Nations, (Especially by Their Majesties Army) at the late Sieges of *Athlone*, *Galoway*, *Limerick*, &c. The Measures and Dimensions of Rampires, Parapets, Moats, &c.

Of Casements, Cittadels, Crownworks, Ravelins, &c. Of Gunnery, the qualifications of a Gunner. Of Ordnance, Morters, Demy-Cannon, &c. with the manner of Batteries, &c. All Illustrated and further Explained by 18 Copper-Plates, curiously designed and Engraven.

LONDON, Printed for J. Moxon, at the
Sign of Atlas in Warwick-Lane, 1692.





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Franciæ, et Hiberniæ REX Fidei Defensor
etc.

P. H. Van. Hove. sculp.


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To the Honourable
CHRISTOPHER SEATON,

Brother to the Right Honourable
George Earl of Winton, &c.

And my Worthy Friend.

Honoured Sir!

I Here present you this Epitome of
the whole Art of Warr, and re-
commend it to your serious Inspection
and Approbation; Depending more
upon the Worth of the Subject, than
my own Deserts: 'Twas chiefly de-
sign'd for the Use and Benefit of Young
Gentlemen and Others that delight
therein: And though 'tis but small in
Bulk, yet great in Matter; and at this

A 2

time



time of as good use, when the greatest part of Europe are engag'd in Warr. What can be more Acceptable in a time of such Eminent Action, than Plain and Practical Instructions in the Military Arts, here comprehended under these two Heads, viz. Military Discipline, and Fortification. Sir, I need not endeavour to inform you of its most excellent use, under the Fortitude of whose favourable Aspect, this small Piece craves a shelter from the Malevolent Rays of Detractions. These are the Arts Mathematical (or Branches thereof.) and in the Mathematicks the two main Pillars are well known to be Arithmetick and Geometry; and these also have the Preheminence above all other Arts, because they leave no Hole to creep out at, or any Querk for Descent, but an Everlasting Addition

dition of new Inventions to what has been happily demonstrated before. This last Age doth enjoy the Benefit of more admirable Inventions, than many former Ages; and we see daily that new ones are still added, both in the Art of Warr, as well as divers other Arts and Sciences. Have we not in our Age seen the Spots in the Sun first discovered by the famous Galateus, with his most excellent Telescope Observations; also his Conversion upon his own Axis, the Lateral Guardians or Satellites of Saturn and Jupiter, the various Phases of Mars, the Horns of Venus and Mercury, the Mountains and Seas of the Moon, the Generation of Comets, cum multis aliis? But I fear I have run out too far for this small Treatise. Sir! 'tis the Censure of You alone which I value, the Popular



*voice, like other Agents, never acting
beyond their proper sphere of activi-
ty. Thus craving the Continuance of
Your Favour and Respect, I shall
ever remain,*

Honourable Sir!

Your Devoted and

very Humble Servant,

J. M.

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O F

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only the constant proportion of Perpendiculars to their Shade, with several Corollaries thence arising, but also an easie, new, and most compendious way of describing Dials on all Plains, as well *Geometrically* as *Mechanically*: most of which may be taught any one in few Hours, though never so unacquainted with Mathematicks.

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A N
EPITOME

Of the whole

ART of WAR, &c.

In two Parts.

THE extraordinary Benefit of the Noble Science called Military Discipline, with that Mathematical Art called Fortification, or Military Architecture, is so well known, that it stands not in need of my commendation: and therefore to speak any thing thereto were but to light a Candle before the Sun. In the managing of these Subjects I shall endeavour to be very plain and easie; calculating them so as to be understood even by the meanest Capacities: And first.

B

of

Of Exercising.

AS soon as the Regiment is drawn into Battalia, the Commander in Chief is to place himself before the Centre of the Pikes, about six Paces from them, that he may be more easily understood by the whole Body; and that he may the better observe what is done, he is to be on Horse-back. The Serjeants are to be placed two on each Rank, the Right and Left; The remainder always to be in the Rere, making a Rank parallel to the Souldiers at three Paces distant from the last Rank. The Drums are to be disposed of, one half on the Right, and the other on the Left, ranging directly with the first Rank of the Soldiers. The Heboys to be on the Right of the Drums. The Commission Officers, are to take their Posts at the head of the Battalions as the Colours are drawn.

The words of Command ought to be given very leisurely and distinctly; and silence is to be kept very strictly: And in order thereunto the first word of Command before you begin the Exercise is *Silence*.

The next word of Command is *Files open to the Right* (or to the Left) *to your Order, March*.

At which word every Man turns to the hand named, and the Serjeants on the Flank lead the Ranks, which are then Files, directly forward with their Halberts advanced. In this order no Man is to stir till his Leader be at least four foot from him, and

and then to move keeping at that distance ; when the Officer sees the Files are opened enough the next word of Command is *Halt, as you were, or to your Leader.*

The Captains and Lieutenants always carry their Pikes Comported when they move to the Right or Left, and the Colours are advanced. The Serjeants are to be very mindful to keep the Ranks even, and at 12 large feet distance, and the Files at three.

The next thing is the Chief Officer gives this word of command, to the Officers at the Head of the Battalion (*Have a care of the Exertise ;*) at which word of command the Musquetiers are to pull off their right-hand Gloves, and put them under their Girdles ; and the Pike-men are to joyn their left hands to their Pikes even with their Shoulders. Then (*Officers take your Post of Exercise in the Rear, March.*)

The Officers facing to the right about, the Captains marching in one Rank, and the Lieutenants and Ensigns in another, till they come into the Rear, and place themselves in Ranks, the first thirteen, and the other eleven Paces from the Souldiers. And at the same time six of the Serjeants at the Rear, march through the intervals of the Files into the Front, and post themselves six paces advanced before the chief Officer, where they are to range themselves into a parallel Line with the Battalion to keep the Front clear.

The Musquetiers being shouldred, the Pikes advanced, and silence commanded, the Officer in chief proceeds as followeth. *Viz. Order your*

Pikes, to the Right, to the Right, to the Right, to the Right, to the Right about; as you were. To the left, to the left, to the left, to the left: To the left about; as you were.

Rules for the Exercise of the Fire-Lock.

THE Soldiers must take care of the carrying their Arms; and be sure that they make no motion until the word of command be given and ended.

Musquetiers have a care of the Exercise; carry your Arms well. Here you must note that if it be a single Exercise, the Command is: 1. Shoulder your Musquets. 2. Lay your right-hand to your Musquets. 3. Poise your Musquets. 4. Rest your Musquets. 5. Cock your Musquets. 6. Guard your Musquets. 7. Present. 8. Fire. 9. Recover your Musquets. 10. Half bend, or half cock your Musquets. 11. Clean your Pans. 12. Handle your Primers. 13. Prime. 14. Shut your Pans. 15. Blow of your loose Corns. 16. Cast about to Charge. 17. Handle your Chargers. 18. Open them with your Teeth. 19. Charge with Powder. 20. Draw forth your Scowrs. 21. Shorten them to an inch. 22. Charge with Bullet. 23. Ram down Powder and Ball. 24. Withdraw your Scowrs. 25. Shorten them to a Handful. 26. Return your Scowrs. 27. Poise your Musquets. 28. Shoulder your Musquets. 29. Poise your Musquets. 30. Order your Musquets.

Rules for the Exercise of the Pike.

Pike-men take heed. Advance your Pikes. To the Front, Charge. To the Right (4 times.) Charge. To the Right-about. Charge. As you were. To the left (4 times) Charge. To the Left about. Charge. As you were. Charge. Advance your Pikes. Shoulder your Pikes. Charge to the Front. As you were. Charge to the Right. As you were. Charge to the Right about. As you were. Charge to the Left. As you were. Charge to the left about, As you were. Port, Comport. Charge to the Front. Traile. Charge. As you were. Advance your Pikes. Musquetiers take heed. Poise your Musquets. Shoulder your Musquets. Musquetiers make ready.

The manner of the Exercise of the Pike
and Musquet together.

Musquetiers make ready. At the pronouncing these words of Command (the Pikes being advanced, and the Musquets shouldered) the Musquetiers are to perform distinctly every posture of the Musquet together, and being ready (which is understood to be Cock't) they are to guard them with their thumbs on their Cocks, and bring up their Musquets streight before them, their left hands the height of their mouths. Both Pike-men and Musquetiers always observing when ever they recover their arms before them, to bring their right heels to their left insteeps; and when the Pikes charge, and the Musquets rest, to fall back with their right feet in a direct line. Then to the Right (4 times) Charge. To the Right about. Charge. As you

were, Charge. To the left (4 times) Charge. To the left about. Charge. As you were. Charge. Recover your Arms. Half bend your Musquets. Poise your Musquets. Shoulder your Musquets. Here the Pike-men are to bring their Pikes from their Recover to their Advance. Poise your Musquets. Here the Pickmen are to joyn their left hands to their Pikes even to their shoulders. Then, Order your Arms is the next word of command. In ordering their Arms they must be lute to make a little stop before the But-end comes to the ground, that they may come down altogether at once. Pikes to your inside Order. Lay down your Arms. Quit your Arms. After laying down their Arms and quitting them, they are all to stand up together. To the right about. March. When the Soldiers have laid down their Arms and quitting them, upon beat of Drum, they are all to draw their Swords, and run to their Arms observing always to keep the points of their Swords upright for fear of mischief. When they lay their right hands on their Swords, they must take hold of their Scabbards with their left hand. Then, the next word is. Return your Swords. When they return their Swords, they must do it all at one motion. Handle your Arms. Pikes to your outside order. Poise your Musquets. Shoulder your Musquets. Advance your Pikes.

Officers take your Posts at the head of the Battalion; March. Here all the Officers are to march back in the same method to the Front of the Battalion as they went from it.

Directions for the several Postures in exercising of the Musquet and Pike; and, first, of the Musquet.

HE that designs to be a Soldier, or become an Artist in Arms, ought, in the first place, to learn and practise the Postures of his Arms, a Posture being a Mode or Garb that we are used unto in the well-handling of our Arms. 1. Silence is an excellent virtue, and observe for all, That in the Exercise both of Pike and Musquet, the Feet are to be at a moderate distance, for if they are too wide asunder, or too near together, it weakens; and be sure to keep your left heel fast, and to set your feet exactly, or else you can never handle your Arms as you ought.

Lay your right hand on your Musquet. Turn the Barrel toward you, the Lock uppermost, and lay your right hand, (the fingers extended) just behind the Lock, close the butt end of your Musquet to your shoulder, that the Muzzels may be all of a height.

Pose your Musket. Grasp your Musquet hard, facing to the right with a quick motion upon your left heel, keeping your Musket directly before you the height of your Cravat, your right elbow on your side, your feet neither too near nor at too great a distance, but so; that by turning the point of the left toe to the Front, and that of your right as you face, your left heel being exactly against the middle of your right foot, you are in the posture for resting;

which is the reason of facing to the right, that you may be in a readier posture to rest.

Rest your Musquet. Let your Musquet sink down to your left hand, and receive the Musquet into it, just where the Scowrer enters into the Stock, not touching the Barrel, keeping your right hand upon your Musquet, behind the Lock, let your Musquet be held a little sloping, about half a foot from your side, as low as you can without stooping.

Cock your Musquet. Place your right thumb upon the Cock, and your fingers behind the Trigger, and with the help of closing it to your thigh, you cock it, keeping it still rested with your thumb upon the Cock.

Guard your Musquet; keeping your thumb upon the Cock, and your fingers behind the Trigger, you bring up your Musquet with a very quick motion straight before you to the Recoze, your left hand as high as your mouth, about half a foot from it, without stooping, bringing your right heel to your left instep.

Present. Fall back with your right foot, so that the left heel be against the middle of it, raising the but-end of your Musquet to your shoulder, your right elbow not higher than your Piece, bending your left knee, and keeping the right very stiff, and your Musquet being level'd breast-high, with your fingers upon the Trigger.

Fire. Then be sure to draw the Trigger at one motion, keeping your body steady, taking good aim, and keeping your Musquet fast to your shoulder, until you have the Word of Command.

Recover your Arms. Sink the but-end of your Musquet, till you hold it upright in both hands, the left hand alwaies as high as your mouth, and the right under the Lock, bring up your Musquet with a very quick motion, and your right heel to your left instep.

Half bend your Musquet, falling back with your right Leg, bring your Musquet to the Rest, laying your right Thumb upon the Cock, and your Fingers behind the Trigger, half bend it, by putting it close to your Thigh, and then keeping your Musquet rested.

Clean your Pan; pressing the Ball of your Thumb into the Pan, you wipe it: having done that, hold your Musquet in your right hand behind the Lock.

Handle your Primer: Take hold of the great end of it, between the Thumb and fore-finger of your right hand, your Arm backward.

Prime. At which time you must level your Musquet, to be exactly upon a line, and then put Powder into your pan.

Shut your Pan with your two first Fingers, and casting back your Primer, bring your Musquet to the Recover, as there directed, keeping your Thumb on the top of the Steel.

Blow off your loose Corns. Be sure to blow all together: bring your Pan up to your mouth, standing upright, blow off the loose Corns, then let your Musquet sink into the posture it was in before.

Cast about to Charge: you advance with your right leg, turning your Musquet, the barrel downwards, bringing it to the left side a little backwards in your left hand, keeping your right-

foot-

foot-toe directly to the Front, and your right heel over against the middle of the left foot, ballancing your Musquet in the left hand, the right hand joyned to the *Muzzle*, which must be held directly to the front, a foot from your body.

Handle your Charger. Take it full in your hand, and place it underneath your Musquet, about an inch from the *Muzzle*.

Open it with your Teeth. Bring it up to your mouth, standing upright with your Head, and not to bring your Head down to it: As soon as you have done this, bring the Charger within an inch of the *Muzzle* underneath, as before, and cover the mouth of your Charger with the Ball of your Thumb.

Charge with Powder. Put the Charge of powder into the barrel, then hold your Charger again underneath your Musquet, as before.

Draw forth your Scourer. Now let fall your Charger, and turn your hand, your little finger next the *Muzzle*, and draw it at three motions; being drawn, dart it, that is, hold it level to the height of your Eye, your Arm extended.

Shorten it to an inch. Turn the great end of your Scourer towards you, and slip your hand till within an inch of the end, letting it rest against your body, a little below your right breast, sloped all of a height.

Charge with Bullet. Take the Bullet out of your mouth, putting it into the barrel, and then put the great end of the Scourer after it, just into the *Muzzle* of the Piece, and so stand till the next word of command.

Ram down Powder and Ball. Which is done by holding a handful of the Scowrer in your hand, and your thumb on the top of it.

Withdraw your Scowrer. Turn your hand, your thumb and fore-finger towards the Muzzle, and when your Scowrer is clear, which is to be done at three motions, dart again as before.

Shorten it to an handful. Turn the small end of the Scowrer to your breast, and slip your hand till within an handful of the end of it, holding it to your body, as before directed.

Return your Scowrer. Re-place it in the Stock of your Musquet; pressing it down with your thumb; then alwaies remember to grasp the Muzzle of your Musquet with your right hand, your thumb streight out upon the Scowrer, keeping your Musquet clear from your side some half a foot, the Muzzels all of a height, directly to the front.

Poise your Musquet. With your left hand bring up your Musquet before you, and falling with your right leg even with your left, grasp your Musquet under the Lock with your right hand, and poise as before.

Shoulder your Musquet as formerly: Poise as before.

Order. Sink your right hand a little; take hold of the Stock with your left hand upon the place where the Scowrer goes into the Stock, then sinking that hand, take hold of the Muzzle with your right hand, and let the but-end sink to the ground, close to the right foot, the Lock outwards.

Lay down your Musquet. Turn your Musquet with the Lock upwards, and step forwards with your left leg and right hand, and lay it upon the ground in a streight line.

Quit your Musquet. Fall back with your left leg even to the right, and stand up.

Handle your Musquet. Step forwards with your left leg, and lay your right hand near the Muzzle of your Musquet.

Order your Musquet. Lift up the Muzzle of your Musquet, and fall back with your left leg even to the right, turning the Lock of your Musquet outwards, by the middle of your foot.

*Directions for the several Postures in exercising
of the PIKE.*

Advance your Pikes. With your right hand lift upright your Pike as high as you can well reach, and take it with your left hand as low as you can, and raise it till the but-end comes into the right hand, then bring it between your breast and shoulder upright close to your thigh.

To the Front. Lay your left hand on your Pike even with the top of your shoulder, and bring the Pike streight upright before you with a quick motion; drawing in your right heel to your left instep.

Charge Fall back with your right leg, so that the heel of your left foot may be directly against the middle of your right foot: Bring down your Pike extream quick, with a jerk, and charge Breast high; your left Elbow under your Pike to support it, yielding your body forwards, and bending your left Knee, with your feet at a convenient distance, that you may stand strong,
always

always holding the But-end of your Pike in the Palm of your right hand, and your left foot pointing in a strait line with your Pike.

To the Right four times. Turn your left Toe to the right; Bring up your right heel to your left Insteps and your Pike recovered straight before you with as quick a motion as in Charging: Then having turned, fall back with your right leg as before. *Charge* as before.

To the right about. Turn your left Toe to the right about; bringing your right Heel as before, and your Pike recovered charge before.

As you were. You turn your left Toe to the left about, bringing up your Pike recovered, your left hand never to be higher than your Mouth, and your right Heel as before; and being turned, you fall back with your Right Leg and Charge. You must be sure always to bring your Pike streight up, and not to swing it about; for then 'twill clatter against the other Pikes.

To the Left, Four times. To the Left about. As you were. Advance your Pikes. Bringing up your Right Heel to your Left Instep, and your Pike first before you, you fall out with your Right Foot even with your Left, and bring your Pike to your Shoulder.

Shoulder. Lay your Left Hand on your Pike even with your Shoulder; fall back with your Right Leg, and put back your Right Arm as far as you well can, holding your Pike half a Foot from your side, then taking off your Left Hand, bring up your Right Leg, and lay your Pike on your Right Shoulder, your Elbow close to your Body, the butt-end half a Foot from the ground.

Charge

Charge to the Front. Fall back with your Right Leg, and put back your Right Arm as far as you can, be sure to keep the Spear directly to the Reer, and your Pike sloped at the same height with the Spear as when it was Shouldered, neither higher nor lower. *Vide Charge.*

Shoulder, as you were. You must now raise your Pike with both your Hands, then leaving it with the Right Hand, and turning the Head backwards with the Left, take hold again with the Right, as high as you can reach with ease, bringing up your Right Leg, taking off your Left Hand from your Pike, Shoulder as before.

Charge to the Right. Bring your Pike up, and turn the butt-end backwards by your Right side, taking it in the Palm of your Right Hand, turning your Body to the Right upon your Left Foot, with your Right Leg behind your Left, and *Charge* as before.

Shoulder, as you were. Raise your Pike with both Hands, then turn about to the Left, bringing your Feet as formerly directed, then with your Left hand turn your head of the Pike to the Right: Then taking hold of it with your Right Hand, hold it in both hands, at a little distance from your Body as before, sloped at the same height as when Shouldered, then bringing up your Right Leg, lay it on your Shoulder.

Charge to the Right about. Fall back with your Leg and Hand as before, and stand with your Pike in the same Posture, then upon your Left Foot, turn to the Right about, bring the Butt-end of your Pike to the right side, falling back with your right Leg, level your Pike Breast high, and *Charge.*

As you were. Turn to the Left about, and with your Left Hand, bring the Butt-end of your Pike by your left side, keeping the Speer-point exactly to the Reer, the same height as before, then laying your Right Hand as high as you can well reach, hold it from your Body as before, then bring up your Right Leg and Shoulder.

Charge to the Left. Fall back with your Leg and Arm as in the rest, and turn to the Left, and with your Left Hand turn the Butt-end of the Pike to the Right, and bring up your Right Leg.

Charge.

As you were. Bring your Pike over your Head with your Left Hand; falling back with your Right Leg, and putting back your Right Arm as before, bring up the Right Leg, and Shoulder.

Port. As Charging to the Front, but that you sink not the Spear of your Pike so low, and instead of letting the Pike rest upon your Left Elbow, 'tis to rest between the Thumb and Forefinger, and your Elbow close to your side.

Comport. You bring your Left Hand as far back as you can, and stretching out the Right at the same time, step forwards with your right Foot, grasp your Pike with your Right Hand; then leaving it with your Left Hand, fall back with the Right Leg even with your Left, close the Pike to your side, the Spear of your Pike about the height of your Head.

Charge to the Front. Extend your Right Arm as much as you can, advancing your Right Leg at the same motion, and putting your Left Hand as far back as you can, bring forward your Pike; then stepping back with your Right Leg, take hold
of

of the butt-end of it with your Right hand, when you *Charge*, *Charge* always Breast high.

Trail. Face to the Right about, and let the Spear of your Pike fall behind you; quit your Right Hand from the butt-end of it, without stirring your Left.

Charge as you were. Turn to the Left about, and taking the butt-end of the Pike on the Palm of your Right Hand. *Charge.*

Advance your Pikes. Bring up your Right Heel to your Left Instep, and your Pike before you to the *Recover*, you fall out with your Right Foot even with your Left, and bring your Pike to your *Right Thigh*.

Order your Pikes. Lay your Left Hand on your Pike, even with the top of your Shoulder, then sinking your Left Hand, take hold of it with your Right Hand so, as when the butt-end of it is upon the Ground, your Right Hand may be against your Eye, keeping your Pike near your Head, and the butt-end near the Latchet of your Shooe.

Pikes to your inside Order. Move the butt-end of your Pike on the inside of the middle of your Right Foot.

Lay down your Pike. Step forward quick with your Left Leg, lay it down strait with your Right Hand.

Quit your Pikes. Bring back your Left Leg even to your Right, and stand up altogether.

Handle your Pikes. Step forward with your Left Leg quick, placing the middle of your Right Foot against the butt-end of your Pike, lay your
Right

Right Hand on your Pike as far as you can reach.

Order your Pikes. Raise the Pike with your Right Hand only, and fall back with your Left Leg.

Pikes to your Outside Order. Place the butt-end of your Pike at the middle, on the outside of your Foot. *Advance, As before.*

C PLATE

Now in ordering a Battalion in this manner the three following Rules are to be observed.

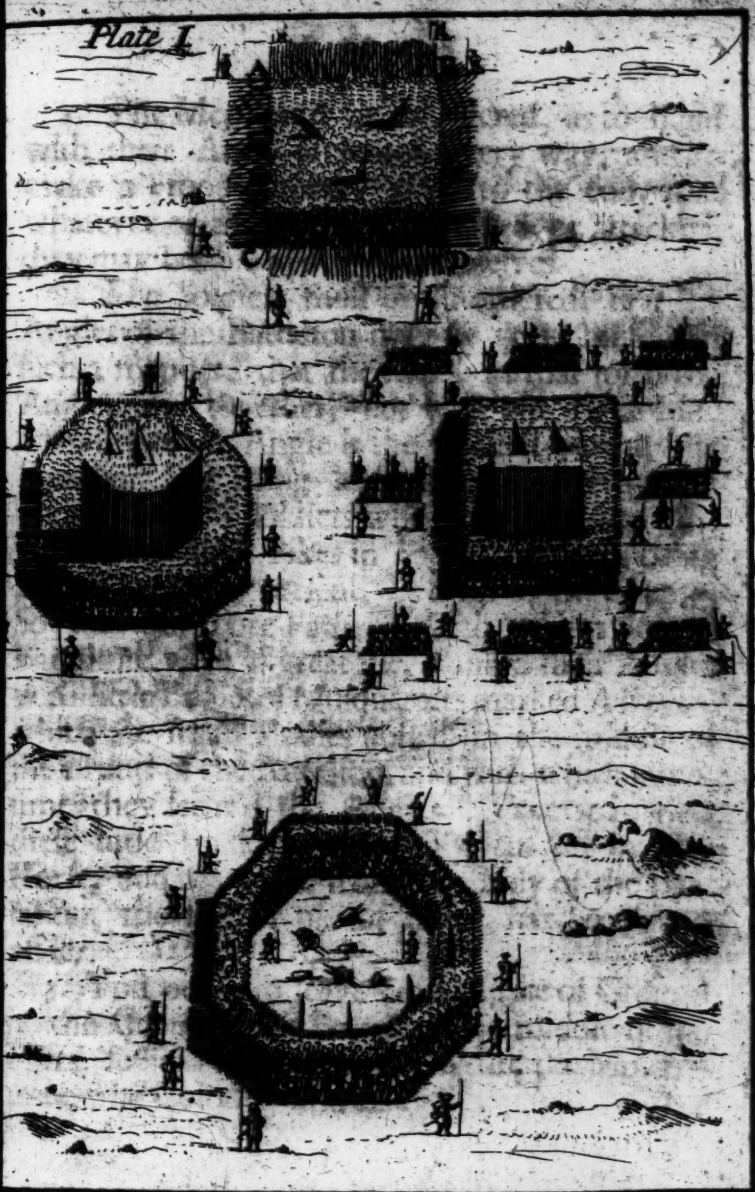
PLATE I.

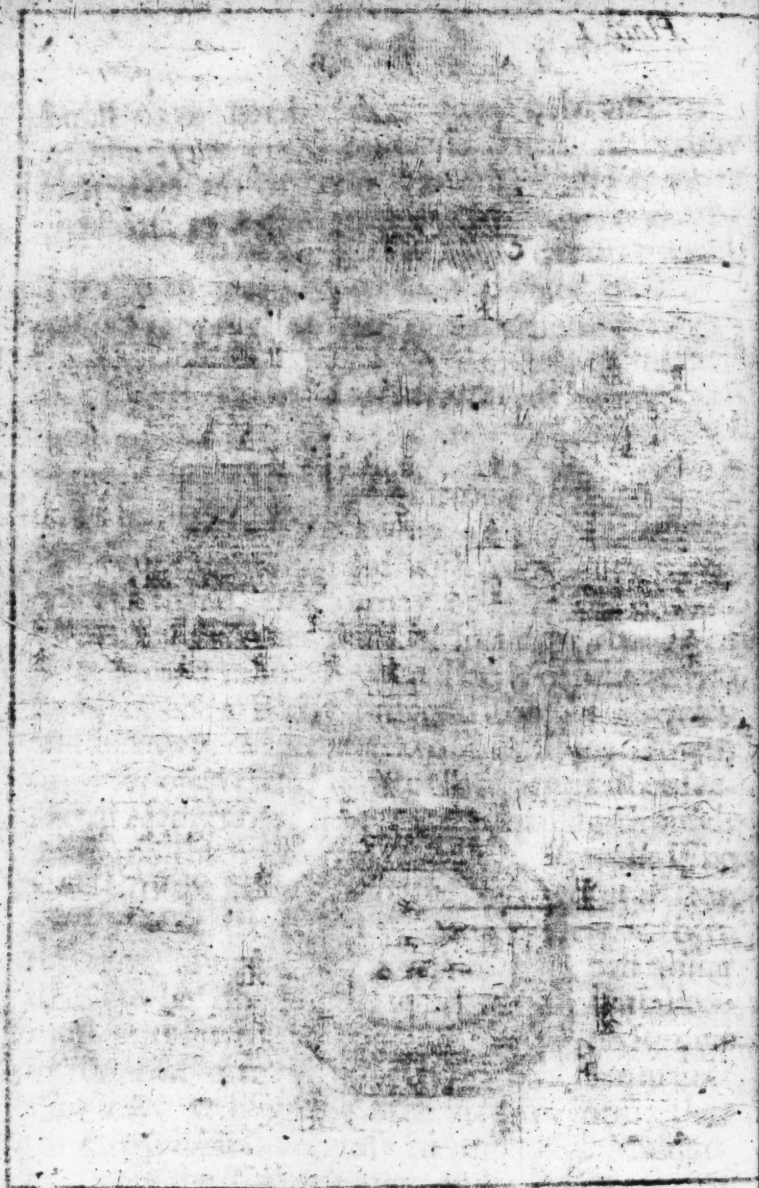
*The Way and Method, how to form
and order Battalions of Foot.*

THIS Excellent Art of forming the Foot, instructs how to draw up a Body of them in such excellent order, and with so much precaution beforehand, that it may be able to withstand and engage another Body of Infantry, though of a far greater number; or a Body of Cavalry alone, or else a Body compos'd both of Cavalry and Infantry, when attacked in a Plain, Down, or in an open Field, where there are neither Defiles as Hedges nor Ditches, nor any rising Grounds to defend them from the Enemy. Now the Pike and Partisan, being the only Arms proper to stop the fury of the Cavalry, and to prevent their breaking in upon the Battalion, the first thing that is to be done in drawing up this Battalion, must be to form a Body of all Pikes, and it must be the chief care of the Officer that commands the Party, to dispose his Men in such a form, that they may be able not only to defend the Musqueereers, but the Colours also, and the Baggage, if there should be occasion.

Now in ordering a Battalion in this manner, the three following Rules are to be observed.

Plate I





1. The Men must be so ordered, as to stand with their Arms presented every way, and to make a Front on every side, to the end, that whatever of their Fronts be assailed, or attacked, they may be able to defend themselves.

2. The Soldiers must be so ordered, that the Angles of the Battalion may be very obtuse, in such a manner, that the two sides that form the Angle, joyn together, but with one right Line only. For the Angle is the weakest part of the Battalion, as being least strengthened by the Pikes. For the Soldiers which are near the Angle, present their Pikes in Front, and not being able therefore to present, lie open to the Enemy. So that our Fore-Fathers, with whom square Battalions were in great use, flanked their Angles with little Bodies of Musqueteers marked A B C D, which are small Bodies posted in the middle of the Fronts of the Battalion, and with which sometimes they secur'd the Angles. True it is, that these little Bodies being easily cut off by the Horse, and beaten off from the Body of the Battalion, the further use of them has been laid aside.

3. You ought to leave void a space of Ground in the Center of the Battalion, or middle of the Pikes, sufficient to receive and secure the Musqueteers, the Colours, and Baggage.

The manner of ordering any number of Soldiers into any Square Form of Battell.

1. These are to be considered either in respect of the Form of the Ground, or of the Number of the Men.

A Square Battell of Ground is that which hath the Rank as long as the File, notwithstanding the Men in Rank be more than in File.

A Square Battell of Men, is that which hath an equal number of Men both in Rank and File, though the Ground on which they stand be longer on the File than on the Rank.

2. In respect of the number of the Men, it is called either a Square Battell, or a Double Battell, or a Battell of the Great Front, which is Quadruple, or a Battell of any proportion of the number in Rank to the number in File.

3. So that if you are to form a Square Battell of Men, extract the Square Root out of the whole number of Men, and the same shall be the number of Soldiers to be set in a Rank. As for Example, 576 are to be formed into a Square Battell, that there may be as many in Rank as in the File. Take the Square Root of 576, which is 24, the Number that are to be in Rank, and also in a File.

To order any number of Men into a Battel of The
Grand Front.

Suppose 16000 Soldiers were to be Marched
into a Battel of the Grand Front. First divide
16000 by 4, which gives me 4000, and
which I extract the Square Root, which is 63, by
the Quadruple whereof is 2500, for that I have
for a File, and 260 in Rank, which will
perform the same with their Pikes as the
Commander's Command: I then Command

Any number of Men, with their distance, to
Rise, then to order them into a Square Battel of
4 Ground without any
Angles; but if there be not room enough

Suppose 5000 Soldiers were to be drawn into
a Square Battel of Ground, for that their distance
in File should be 7 Feet, and in Rank 3 Feet, How
many Men must be placed in Rank and File

From Rank to make ready their Command
[say, by the Rule of Three, as 7 to 32 for
2500 to 1071, the Square Root whereof is 32,
which is the number of Men in a File, and 32 over
How to find the number of Men that are to pass
Rank, divide by 100 by 32, the Quotient is 78,
which is the number of Men to be placed in a
Rank, and power is 1071, and 32 over

Passes, and 32 over, and 32 over, and 32 over
[say, by the Rule of Three, as 7 to 32 for
2500 to 1071, the Square Root whereof is 32,
which is the number of Men in a File, and 32 over
How to find the number of Men that are to pass
Rank, divide by 100 by 32, the Quotient is 78,
which is the number of Men to be placed in a
Rank, and power is 1071, and 32 over

*The manner how to order the Square in time of
Battle.*

THE Square being formed at aforesaid, the Officers are to take care, that every Front of Soldiers do their Duty; and the Captains that are in the Center of each Front, are to retire into the first Rank, when the Musqueteers make ready, and are to kneel when the Soldiers kneel, and to perform the same with their Pikes as the Pikemen do: Then Command; *Granadiers take your Posts in the Angles.*

Here your *Granadiers* are to be divided in 4 equal parts, and are to be placed without at the 4 Angles; but if there be not room enough, you may place some of them within the Angles with their Daggers in their Firelocks: Those without the Angles are to be 3 deep. The 2 last Ranks of which are to sit with the Musqueteers. And the Front Rank are to make ready their Granadoes. And as soon as the two last Ranks have fired, they are to put their Daggers into their Firelocks, and stand Charged; and when the first Rank of Musqueteers present, the first Rank of *Granadiers* are to deliver their Granado's; which done, they are to unslung their Firelocks, and put in their Daggers, and stand Charged as the rest.

2. *Face Square.* Here the Musqueteers on the Right and Left are to face outwards, and those to the Rear, to face to the right about. The 3 outwardmost Files of Pikes on the right and left, are to face outwards, and the Rear half Files of the rest

rest of the Pikes are to face to the Right about. Those in the Angles are to face to the points of the Angles.

3. *Musqueteers make ready.* Here the Pikes are to Port very low, and to continue so, and not to Charge when the Musqueteers Present.

4. *First Rank Kneel.* Which they must do, holding their Musquets, so that the two last Ranks may fire over them.

5. *The two last Ranks Present, Fire.* As soon as ever the second and third Rank have Fired and Recovered their Arms; the first Rank is to stand up without any other Word of Command, with their Musquets Cocked and Guarded, ready to Present.

6. *Recover your Arms.* Here the first Rank stands up with their Musquets recovered strait before them, ready Cocked and Guarded, and the two Ranks that have fired load.

7. *From Rank Present.*

8. *Fire.*

Recover your Arms. At which Word of Command, the Pikemen are to recover their Pikes from their Port. To your Leader, *March, Halt, Face, Square, &c.*

According to this Method, they may be made to March and to Fire to every Front.

PLATE II.

The General Rule for the blunting or filling up the Angles of the Battalion.

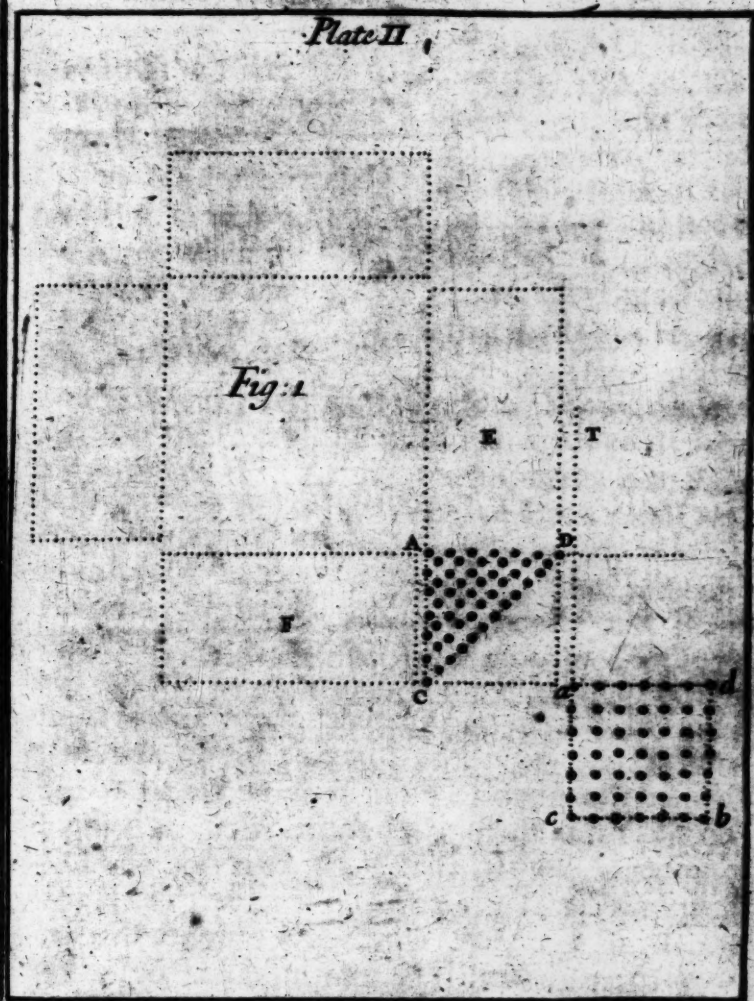
EVERY Body, whether lesser or greater, that requires the blunting of its Angles, ought to be compos'd of a Square number of Men, as of 4, 9, 16, 25, 36, 49, &c. Therefore you must place the Men in Rank according to the Arithmetical Progression, or Proportion, of which the Interval, Excess, or Difference of the Terms must always be two: Thus, having placed the first Man at the Angular Point A of the Figure 1, the second Rank shall be of three Men, as being a number of which, the Excess, Interval, and Difference is Two in respect of one. The third Rank shall be of five Men, which is a number that exceeds three by two. The fourth shall be of seven; the fifth of nine, and so forward, still encreasing every Rank by two Men, more than the Rank which is before, according to the same Arithmetical Progression, which has always two for the Interval, and difference of the Terms.

Now to place these Men in due Order, you must imagine that the Square little Body ACBD; moves off the Ground T, upon the left of the

Batta-

Plate II

Fig. 1



Battalion Q; and when its last Rank AD, is advanced one Pace beyond the Wing AD of the same Battalion Q, it turns to the right, and then the Soldier A of the Second Figure comes upon the Ground A of the first Figure. The sides AD, AC, of the small Body meet together upon the sides that answer one another, AD, AC of the Angle. Then you Command the Men of the little Battalion to make a Front toward the Angle, and when they are drawn up according to this Arithmetical Progression, you cause them to make an outward Front.

D

PLATE

PLATE III.

The manner of framing an Octogon Battalion with Eight Fronts.

SUPPOSE it a Battalion of 40 Pikemen, drawn up four deep, and 10 in Front. You may, according to the same Method, draw up like an Octogon, any number of Pikemen that shall observe the same Proportion of 4 to 10, between Front and Depth, as 8 in Depth, and 20 in Front, 16 in Depth, and 40 in Front, or 32 in Depth, and 80 in Front. For in this Example I have chosen this little number of Pikemen, to give the more light to the ordering and disposing of a far greater number.

The Words of Command.

1. *The two right hand Files, and the two left hand Files stand fast.* A B, I L.

2. *The half File of the two right hand Files, face to the right, B.*

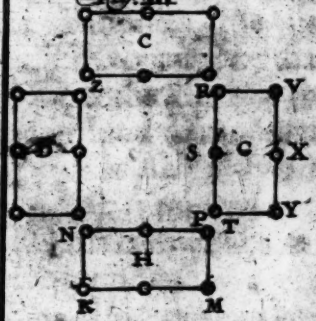
3. *The half File of the two left hand Files, face to the left L.*

4. *Files of the Wings, March.*

The half File B moves into the ground 4, L moves into 5, A moves into 7, and I into 8; which four Bodies are designed to blunt the Angles.

There

Fig. III

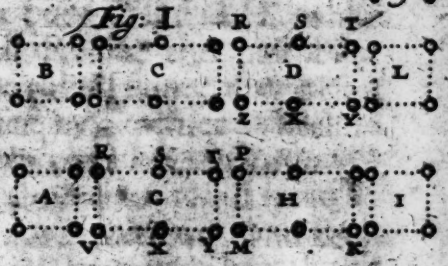


4.

Plate III

5.

Fig. I



7.

8.

Fig. IV

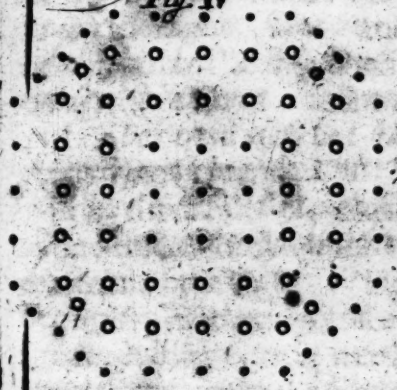
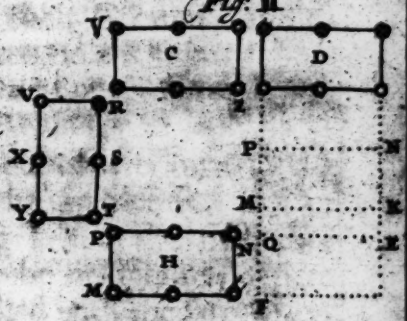
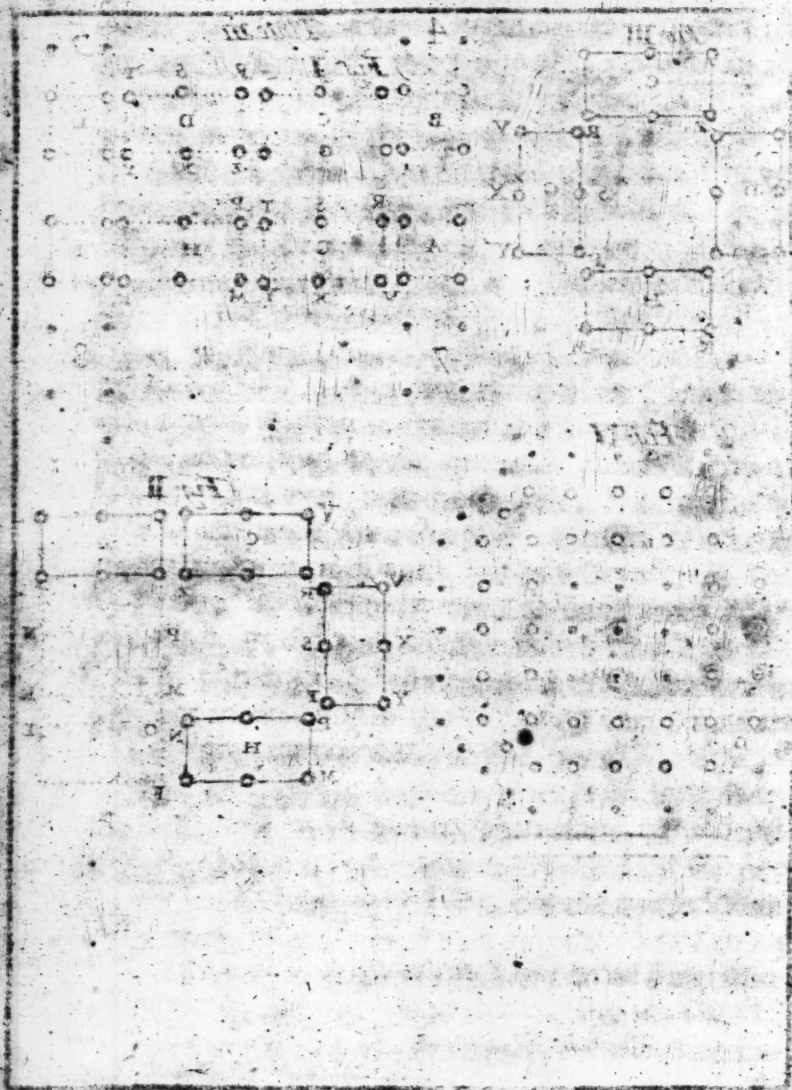


Fig. II





There remains afterwards upon the ground of the Battalion, the six Files C D, G H, which must be opened by half Ranks, and half Files, to form the Cross of the third Figure, and to clear the ground of the Center, by a quarter Wheeling.

5. *The half File of the right hand half Rank C, half turn to the Right. Order your Pikes.*

C makes a Front towards the Rear, and keeps his ground.

6. *File-leader of the right hand half Rank to the right, G. March. Stand.*

The three Files G, make a Front toward A, upon the right Wing, and advance on that side, two or three Paces beyond their Ground; and so that which was a File is become a Rank.

7. *They that marched stand fast, G to the Right, a Quarter Wheeling.*

The three Files G, make a quarter turn to the right, and wheel about the Soldier R, in like manner as the right Wing T Y of the first, and became placed, as you see the 2d Figure; where the three Files G, are marked with the same Letters as they are in the Body of the first Figure.

And because, that after the Wheeling, they make a Front toward V R, to the end they may make the Front outward on the side of V X Y. (The next Word of Command is:)

8. *To the left. — Order your Pikes.*

9. *File-leader of the left hand half Rank, stand upon your Guard, H. March.*

Take notice in the 2d Figure of the three Files H, marked with little Points. These you cause to march forward along the Line marked P M, Q F, to gain the ground H, marked with three

great Dots in the same Figure. But to gain this ground, they march beyond the ground of the Battalion, till the second Rank pointed P N, have advanced three Paces farther than the Flank Y T, of the three Files G, which then make a Wheeling, which will happen when the Soldier P, shall be upon the ground Q, and that the Soldier M, shall come upon the ground F, at what time the Word of Command.

10. *To the Right. — March.*

To make a Front toward the three Files G, and when they shall come to be three Paces from the Rear of the three Files G, then Command them.

11. *To the Left. Rest your Pikes.*

Then they will make a Front outward, and so shall keep their ground.

12. *The half File of the left hand half Rank, stand fast, D. March. Stand.*

The half File D, advances two Paces beyond its ground.

13. *To the Right. — A Quarter Wheeling.*

The half File D, makes a quarter Wheel about the Soldier Z, and because that after the Wheeling, they make a Front inward toward the Center, therefore to change the Front outward, the Word of Command is:

14. *They that made the Quarter Wheeling, wheel by half Conversion to the Right.*

The Cross being thus made, you bring the four Files upon the Ground, 4, 5, 7, 8, and blunt the Angles according to the foregoing General Rule.

PLATE IV.

The manner of drawing up a Battalion in a Hexagonal Figure, with a void Space in the Center, and the Front of the Battalion five times exceeding the Depth.

WE suppose the Battalion to consist of 720 Pikemen, 12 Deep, and 60 in Front, which is to be drawn up into an Octogonal Figure like that marked 3.

The Battalion being drawn up in the large black Draught of the first figure, to bring it to the Square marked with Points in the same figure, the following Words of Command are to be made use of.

1. *The twelve Files of the Right wing, of the twelve Files of the left wing, Stand fast, C. D. 2. P. A. B.*

2. *The six Right-hand files of the Right-wing, and the six left hand files of the Left-wing, C. D. A. B.*

3. *They that have advanced double their Files inward to the Front and Reer.*

A. Takes the Ground V. B. takes the Ground T. G. takes the Ground G O, and D. possesses R.

4. *They*

4. They that had the word of Command, and they that have doubled, stand fast, V P T, O Q R.

5. Middle files stand fast M E.

6. Advance your Pikes, Middle files E M.

7. The half file of those that advanced their Pikes, wheel by half Conversion to the Right M.

8. March those that advanced their Pikes, till the first Rank be advanced one Pace further than the first of the files that doubled Front and Reer.

M and E move and change into the Ground marked with the points M and E, and from the square represented by the same points, which is afterwards to be considered in the figure K.

9. The six right-hand Files and the six left-hand Files that marched wheel, by half Conversion, into I F, H H, which done, face towards the Center of the Battalion.

10. They that have wheeled by half Conversion to the Right, march toward the Center till the last Rank be all entred.

I and F come upon the Ground Y, and H H upon the Ground G G where as they stand, they are caused to turn to the Right and Left, to advance forward, that is, Y fronting Y. and G. fronting G, by which means Y Y. G G. possess the Ground of N N N N.

The Ground I Y. and F Y becomes void.

Then the word of Command is to be given to the two particular Battalions, O Q R, V P T, which in regard they make a front inward, you must order the Battalion O Q R, to make a half wheel to the Right, and the Battalion V P T, to make a half wheeling to the left, and by that means they will make a front inwards, and you

you shall cause them to march to the Center, and the O and V shall possess the ground Y, Y, and R, and T shall possess the ground G G.

Then you must cut off eight fourths of the Ranks OR V T L L L L, and reduce them into Triangles, to blunt the four Angles that are next them, and the Battalion shall be formed after an Octogonal figure, as in the figure marked δ , where you see the same letter made use of here, they answer to the same letters in the two other figures.

You have 532 Musquetiers at 12 in depth, and 44 in front, there will remain 4. The 532 Musquetiers shall serve for the Flanks of the Battalion of Pikes, and to that purpose you shall take 12 files of the right Wing, which will make 144 Musquetiers, and as they will be equal in front to the Body of the Pikes marked E, you shall march them to the head of the said Body, and cause them to enter into the Center through the Intervals of the Pikes.

When they are advanced towards the Center, divide the Ranks into half, so that one half Rank shall march towards the Body of Pikes marked Q, and the other half Ranks towards the Body of Pikes marked P.

After this take from the left Wing of the Musquetiers 12 files more, which make 144 men; and cause them to advance towards the Center through the Intervals of the Pikes E, and then divide them by half files.

One half File shall advance toward M, and the other half File shall stand their ground behind the Pikes E.

For

For the 304 Musquetiers that remain, they shall make the two Files that surround the whole Body.

PLATE V.

The way and manner of reducing a Battalion with a void space in the Center.

YOU begin with the Musquetiers which you command from the Center through the several fronts M P E Q, which together with those that surrounded the Body, you cause to rank and file themselves as they were.

As for the Pikes that form the Octogonal Body, you give them the following words of Command:

1. *They that stand in the Angles to your Places, O, and R, resume their distances, and make the same front at Q. The files V and I do the same in respect of P, and the files LL observe the same order; in regard of the Pikes M E.*

2. *The twelve files of the right wing, and the twelve files of the left wing, that doubled Front and Reer, stand fast O Q R, V P T.*

3. *March files of the wings that have received the word of command; O Q R and V P T, move off, and march forward.*

4. *They that doubled Front and Reer to your places, O and R, return to the ground which is marked in the first figure, by the letters C D and V T, return to the ground A and B of the first figure.*

5. *The*

Plate V

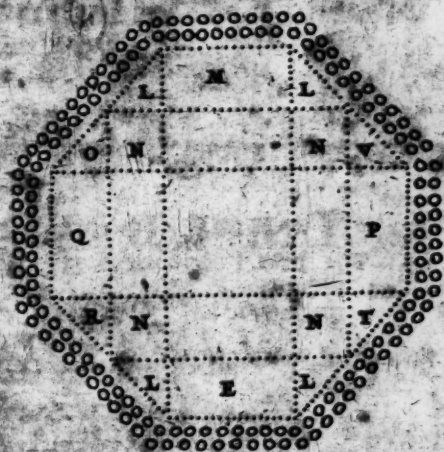
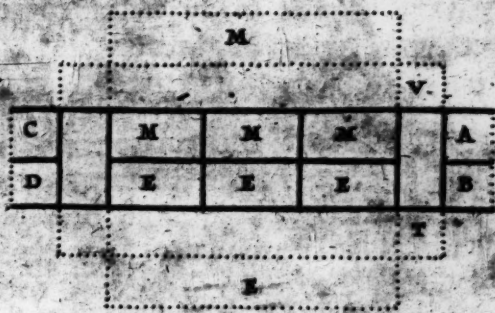


Fig 1.



For the 304 Musquetiers that remain, they shall make the two Files that surround the whole Body.

PLATE V.

The way and manner of redacing a Battalion with a void space in the Center.

YOU begin with the Musquetiers which you command from the Center through the several fronts M P E Q, which together with those that surrounded the Body, you cause to rank and file themselves as they were.

As for the Pikes that form the Octogonall Body, you give them the following words of Command:

1. *They that stand in the Angles to your Places, O, and R, resume their distances, and make the same front at Q. The files V and T do the same in respect of P, and the files LL observe the same order; in regard of the Pikes M E.*

2. *The twelve files of the right wing, and the twelve files of the left wing, that doubled Front and Reer, stand fast O Q R, V P T.*

3. *March files of the wings that have received the word of command; O Q R and V P T, move off, and march forward.*

4. *They that doubled Front and Reer, to your places, O and R, return to the ground which is marked in the first figure, by the letters C D and V T, return to the ground A and B of the first figure.*

5. *The*

Plate V.

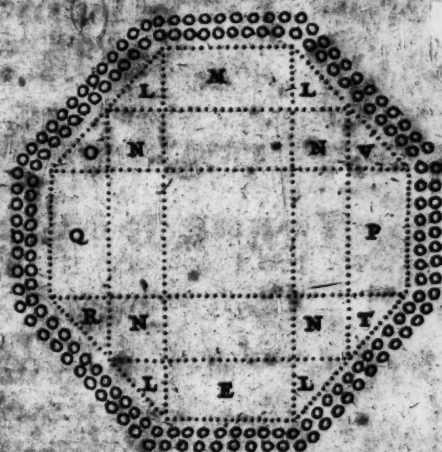
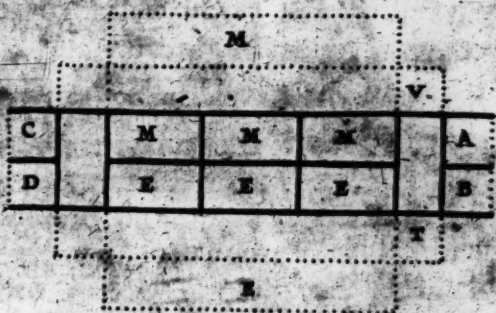


Fig 1.



A		M							
		S		E					

5. The Files that marched toward the Center, to their places; the four small Squares N N N N, return to the Front of M. and E.

6. The middle Files stand upon your Guard E. M.

7. The half File, of the middle Files, half a Turn to the Right, M makes a Front towards the same Center.

8. File-Leader of the middle Files, half a Turn to the Right, E makes a Front towards the same Center.

9. March middle Files E and M, move forward till they come upon the Front CDQ, and PAB of the first Figure.

10. File-Leader of those that marched, half a Turn to the Right, E returns to its first Front, and the Battalion is reduced.

Directions for Firing.

1. In keeping of Ground: This way of Firing may be performed either by two Ranks at a time, or three Ranks; The first Kneeling, and the second Stooping, or the two first Stopping; or else thus, Musketeers make ready all, at which time the Musketeers are to be Cocked and Guarded, and their Arms strait before them, the Pikes Ported, and when the Musketeers Present, the Pikes are to be charged. Then

The five first Ranks Kneel, The Reer Rank Present, Fire; Fifth Rank stand up, Present, Fire; Fourth Rank Stand up, Present, Fire. And so of the rest.

And as they have fired, they are to charge again, and to be in a readiness against the next Word of Command.

2. For Fire gaining Ground, the Command
E is,

is, *Fire* Rank and *Musketeers* make ready, *Halt*: Then *Present* and *Fire*. Here they are to recover their Arms without any command, and to file off to the Right and Left into the Rear. When the first Rank presents, the next Rank is to make ready without any Command, and as the first Rank files off, the next make good the Front, and so the Battalion is to March again, and every Rank to Fire in this order; And when every Rank presents, the Pikes are to charge without any command.

3. Of Firing to the Front retreating. The best way is to Fire by single Ranks, in the same method as in gaining Ground, only after every Rank has fired and filed off to the Right and Left into the Rear, instead of the next Rank advancing to make good the Front of Pikes, the Pikes are to retreat to the Musketeers, who stand still till the Pikes make an even Front with them.

PLATE VI.

The best Way and Method of Marching an Army in a Flat and Plain Country.

THE General having given out Orders the Night before he designs to March the Army, let every one be ready to march the next Morning by break of Day. The Horse and Foot shall repair betimes in the Morning, under their

Plate 5 p. 66.

their several Colours and Ensigns, to the place where every Company is to be drawn up.

All the Companies being drawn up, they shall begin to March, and must range themselves in Squadrons and Battalions, to be afterwards embattel'd in the Ground marked out by the Marshal of the Camp, or his Assistants.

The Marshal of the Camp ought in the first place to be exactly informed of the condition of the Country through which the Army is to march; taking his Instructions from the general and particular Maps of the Country, or from the Information of the Country People.

He shall draw up his Men in Battel-Array, according as he thinks most convenient, or as the General shall have given him Order. If it be through a plain and open Country, which is convenient for the Cavalry, the Artillery and Waggon, then let him extend the Wings of the Army, and observe the following Order.

He shall divide his Army into three Bodies, that in the middle must consist of three Thirds of the whole Infantry, drawn up in great Bodies and Battalions, each consisting of two or three Regiments.

Upon the Wings or Flank of this Infantry, must be placed the great Artillery, guarded by some Battalion of the Infantry.

Upon the Right and Left Wing of this middle Line shall the Cavalry march, in little Squadrons, each consisting of two Cornets. The rest of the Infantry marching in little Bodies, shall enclose between it and the Cavalry, the Baggage and Ammunition of the Army, with some Field-

Pieces; as may be observed by the March represented in the Figure.

PLATE VII.

Of the March of an Army through an Enemies Country.

IF there be a Necessity to carry the War into the Enemies Country, either to Besiege some place therein; or else for the Relief of some place already besieged, whether the Enemy be beaten in the Field, or whether he still keep the Field to put new Supplies of Men and Provision into the Garrison, or hinder Provision from being brought to the Enemies Camp.

Upon all these Occasions whether he encamp in the Field, or Quarter in Villages, the General must take care that the Commissary General of the Victuals, and the Treasurers at War be diligent and faithful in their Charge, in providing and furnishing the Army with Victuals.

If the Enemy has been routed, and be not in a condition to recruit, then you may march as in the preceeding Pages, whether the Country be open or streighter.

But if after a Rout the Enemy be rallied again, so that they are able to make Head against the Victor, then it behoves the General to march close; and to the end the Army may be in a condition to open their Passages and make their own way, it must be divided into little Bodies.

The

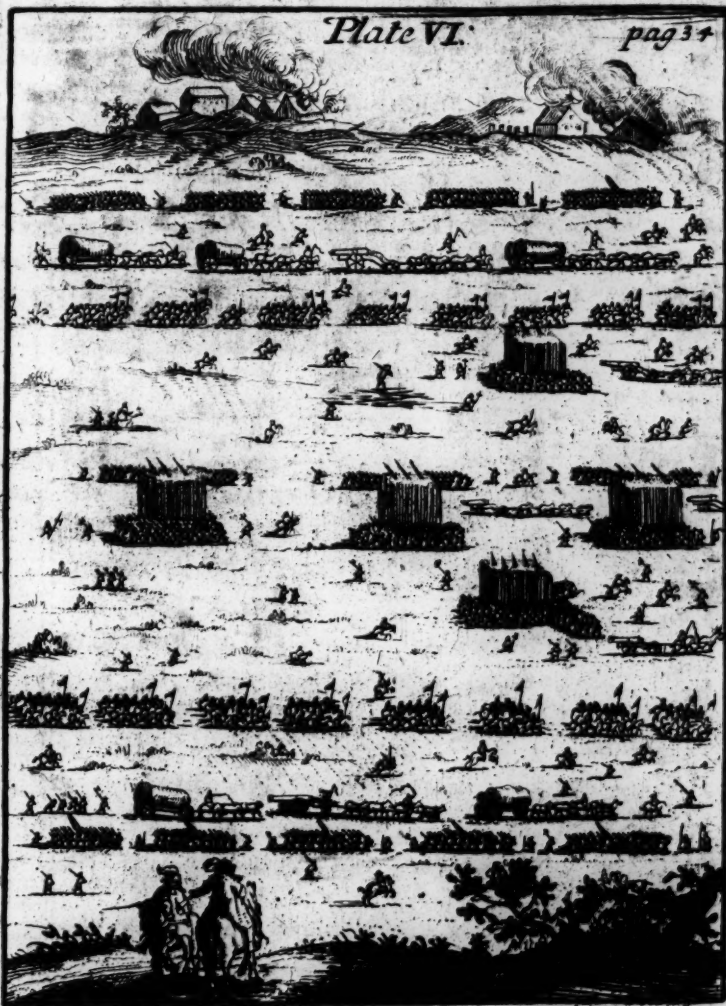
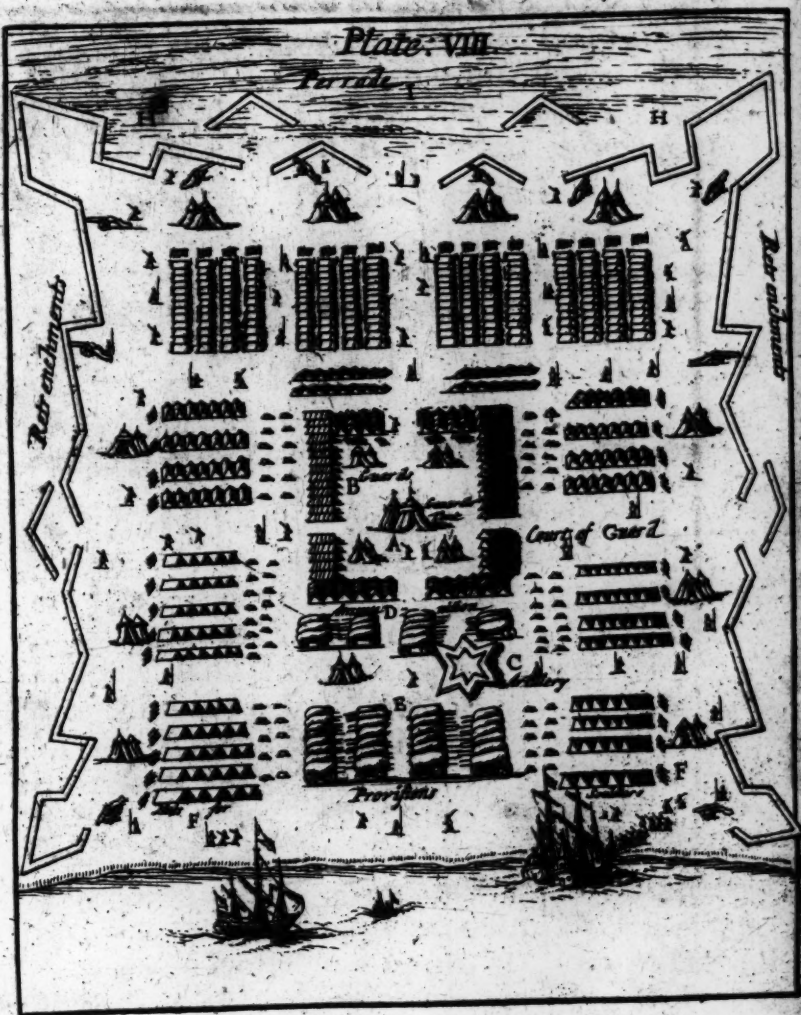


Plate. VIII

Fortitude



The Cavalry must be placed upon the Wings, in Front and in the Reer of the Bodies. The Infantry must march in the middle, and in a gross Battalion. The Artillery upon one side, guarded by some old Regiments, as you see in the Plate.

PLATE VIII.

General Directions for Encamping an Army.

WHEN the Camp-Master General, or Major-General hath read the Number of the Horse and Foot that are in the Army, he must proportion and cast up what space of Ground will suffice to encamp them with all their Provision, Carriages, and so that neither for due Room the Soldiers be pestered, nor by over large Spaces the Camp not sufficiently fortified.

This being of great Importance, it will be requisite for him to understand well Arithmetick and Geometry, and to have in readiness sundry Plans and Models, and Forms of Camps, whereby he may suddenly resolve for any Number or Situation, what Form and Quality is most convenient, and presently stake it out; assigning due place for every Regiment of Horse and Foot.

Before Encamping he ought to consider, if the Army consist much of Horse, that there be good store of Forrage nigh the Camp, and that the Camp be not subject to any Hill from whence the

Enemy may with his great Artillery incommode it: Nor that it be so separated from Water, that the Enemy may easily cut you from it; nor that it be so low, as that the Enemy by cutting the Banks of any River, may drown the Camp. And if there be no great Rivers, but only Fountains or Wells of Water, then must good Watch be kept that they be not poisoned nor infected by the Enemy. In a running or moveable Camp, the readiest Fortification is to impale it round with the Carriages chained together, bending the Artillery that way where most suspicion is the Enemy will approach; and if time permit, to cast some Trench also without the Carriages.

PLATE IX.

The manner of Ranging a Battel in order to a present Engagement.

A General is sometimes constrained to a Battel when he is in an Enemies Country, upon the false reports of his Spies; especially of such as play fast and loose, receiving pay from both sides, which are a sort of People very dangerous. Sometimes through the ignorance of those that command the Parties, who seeking to get intelligence of the Enemy, never inform themselves thoroughly of their March.

Sometimes

Plate IX.



PLATE IV

Sometimes he engages himself voluntarily, designing to relieve some place that is Besieged. But what way soever it be, that he is forced to come to a Battel, he must endeavour to order his Men after the following manner.

He shall range his Infantry in Battalions, every one consisting of five or six hundred Men, or a thousand Men, which are the most convenient Numbers, with the Numbers between, to form a just Body. For those Bodies that exceed the number of a thousand, can never be drawn up conveniently upon all sorts of Ground; and such as are under 500 will never be strong enough to resist at the same time the fury of the Enemies Horse.

His Cavalry which should be always drawn up upon the Wings of the Infantry, must be drawn up in Squadrons, consisting of an hundred and twenty or thereabouts. But the best and those that are most serviceable to break the Battalions of the Enemy, are those that consist of 150 or 200 at most; for if they exceed the number of 200, they are not easily, nor conveniently drawn up by reason of the length of their Ranks, and the number of Horses. And thus it was that the late Duke *de Schonberg* Embattled his Forces at the Battel of *Montesclar*, which he won from the Marquess of *Caracene*.

An Army which is Embattelled in small Divisions of Horse and Foot, is not so easily routed as that Army which is Embattelled in great Divisions. And small Divisions are much more ready than great: For besides seconding one another, and wheeling upon all occasions, they will likewise outfront an Army which is Embattled

battled in great Divisions: The which is one of the greatest advantages that can be taken in the Embatteling of an Army. Small Divisions of Horse and Foot are also much readier for service, where you cannot Embattel them according to the Rules of Art by the nature of the place, or with Inclosures, or where the brevity of time will not give you leave; besides, small Divisions are much more troublesome for an Enemy to deal withal, than an Army that is Embattel'd in great Divisions.

FINIS.

O F

FORTIFICATION.

PART II.

*Of general Maxims or Rules observed
in Fortifications.*

IN the handling of this Part I shall be plain,
yet brief as possible.

1. General Maxim is, That all the parts of the Place, be of *Cannon Proof Flanked*, i. e. defended from another place, which place is not further distant, than the reach of a *Musket-shot* from the place to be *flanked* or defended.

2. That in all the Place, there may be no part of the *Wall*, or outside of the *Rampire*, that is not seen from the top to the bottom of the *Mote* or *Ditch*.

3. That the *Bastions* are large, and full of Earth, and not empty; the bigger they are, they are the more to be esteemed, there being the more

room to intrench in case of necessity: whose Gorge let be at least 35 *fathoms*, and their flank at least 18 *fathoms*.

4. That the *Angle* of the *Bastion* or *flanked Angle*, be not much above 90, nor much leistan 60 *Degrees*, for in the former it would be too very *Obtuse*, and open, at the Point, and in the latter it would be too slender, and so easily to be battered down by the Enemies Cannon.

5. That the *Angle* of the *flank* may be somewhat *Obtuse*; neither is there any more virtue in a *Right-Angle*, than any other, for the defence of the Fort.

6. That the length of an extended *Curtain* be not above 135 *Fathoms*, nor the single above 80 *Fathoms*, nor be leistan 40 *Fathoms*, to be well defended from two *Flanks*.

7. That the *Rampier* be so wide, that so a *Parapet* of Earth Cannon-proof may be erected thereon, and a *Teraplane* left, full wide for the *Ordnance* to be recoiled.

8. That the *Mote* or *Ditch* be at least 20 *Fathoms* broad, and as deep as possible. Now dry *Motes* in great Cities are to be preferred before others that are full of Water, to facilitate the *Sallies*, the relief and retreat of the Besieged; and in small *Fortifications* the *Motes* full of Water are the most esteemable, because in such, *Sallies* are not necessary, and Supplies are very much to be feared.

9. That the Parts that are most remote from the *Center*, be commanded by those which are nearest to it.

10. That the Defence of a Face is much stronger, when the Angle made by the Face and *Exterior*



rior Polygon is a great Angle; this *Maxim* is so very essential, that it will try the goodness of any *Fortification* whatsoever. Thus I have described the Ten chiefest *Maxims*, necessary for good *Fortifications*.

PLATE I.

Of Cazemates.

BEFORE I give you the Measures of my *Cazemates*, I shall explain all the parts of which they are compos'd.

A is the winding pair of *Stairs* to descend from the *Rampart* into the first *Cazemate*, which is six foot high above the bottom of the *Mote*; And this is that which I call the *Great Cazemate*.

B is the *Great Cazemate* seen in part by the *Besiegers* when they are lodged upon the *Level* of their *Paropets* and *Courtains*.

C. Is the *Paropet* of the *Cazemate*, 3 or 4 fathom thick to cover the *Cannon* and the *Cannoneers* from the sight of the *Counter-Batteries* of the *Besiegers*, when they have either raised or earthed them within the *Counter-scarps*.

D. Is a part of the great *Cazemate* wrought farther in, always covered and defended by the *Great Ear*, and flanked *Angle* of the opposite *Bastion*.

E. Is its *Paropet* or *Breastwork* 3 or 4 fathoms thick.

F. Is the *Magazine* for *Powder*, *Bullets* and other

other Ammunition belonging to the *Cazemate*, it must be cover'd and hollow'd inward, into the solid substance of the *Bastion*.

G. Is the pair of Stairs into the second *Cazemate*.

H. Is the second *Cazemate* that lies out of sight, as being about *two thirds* of it, not to be seen by the Enemy, though they should come to be lodged upon the *Counter-scarps* themselves.

I. Is the *Paropet* of the *blind Cazemate*, 2 or 3 fathom thick.

K. Is its Magazine, made like the Magazine belonging to the former.

L. Is the *third Cazemate* not seen, and raised even with the *Platform* of the *Bastion*. Upon this may all sorts of *Artillery* be planted, to shoot as well above the *Paropets*, as through the *Holes* that are cut through the thickness of the *Paropet*, which is from 2 to 3 fathoms.

M. The *Draught* of a *Platform* for the planting of *Cannon*, called a *Cavalier* with its peculiar *Magazine*.

The Structure or Manner of making the Cazemates, according to M. Mallet:

I shall not here go about to *entangle* my self in a *vain Dispute* with those that would have the word *Cazemate* to be derived from the *Spanish* words *Caze* and *Mata*, as if we should say, *A House of Murder*; And therefore without more ado, I come to shew you how my own are made.

Suppose the *Bastions* to be drawn out in *white lines*, that the *Scale* be made *full the length* of one of the sides of the *Polygon*; and that it be divided

divided into as many equal *Parts* as it contains *fathoms*, as has been explained. Then extend the *Defence* of the *Bastion* *AB*, from 6 or 7 *fathoms* at most, from *B* to *C*; from the Point *C* draw *CD* parallel to the flank *BE*, then divide the flank *BE* into two equal parts, at the Point *F* to draw from the Point *G*, which is the middle of the opposite Front *AH* the Line *GF*, to the inside of the *Bastion*, observing where it cuts *C* *D*, as in *L*, purposely to carry on one fathom from *I* to *L*, afterwards draw the Line *MLN* parallel to *FI*, the length of which from *M* to *N*, must be 11 fathom: That done, make *NO* parallel to the flank *BF*, the length of which from *N* to *O* must be 4 fathom. Lastly, make *OP* parallel to *FI*, and then all the void space *BMNOPC* shall be the extent of the *Cazemates*, as well of the large *Cazemates*, as those which are more private.

To make the *Shoulder* or *Ear* of the *Bastion*, draw upon the Line of *Defence* *PS* 6 fathom from *E* to *I*, and upon *FG* 6 fathom; also from *F* to *V* and then joining *V* and *T* together, you have the whole *Shoulder* or *Ear* *FVTE* which must be all one solid piece. For the *Paropet* of the first *Cazemate*, you must allow within side one *Toise* of height from 3 to 4 in thickness, with 8 firing *Places* for the planting of so many great *Guns*, observing that the *Paropets* of the *Cazemates*, more especially all that which is next to the *Gorge*, and lies always hid from the *Besiegers*, do not require a length and thickness so precise.

A *Ravelin* is a Bulk of Earth almost like a Bulwark, cut off lying beyond the Ditch for the

covering of the *Courtain*, *Bridge* or *Gate*, and is surrounded with *Water*, and separated from the *Fortification* by the breadth of the *whole Ditch*; it is raised but a little height above the level of the *Ground*; towards the *Enemy* 'tis built with a *Rampier* and *Breast-work*, but lies open towards the *Fortification*.

PLATE II.

The Raising of Cittadels with five Bastions, which are built upon the Walls of Cities.

WHEN Cities are well peopled, and that the nature of the *Ground* will suffer it, 'tis usual to lay the *Cittadels* towards the *open Field*, to prevent the ruining of the *Buildings* of the place; so then after you have agreed upon the number of *Bastions*, as here for Example upon five to make a *Pentagon*.

Divide one *Courtain* of the City *AB*, into 4 equal parts, of which *AC* comprehends three. This *Overture* being designed at the Point of the Bastion *D*, draw the *Circumference* *EFHG* that you may have the five sides of the *Polygon* *EIIHHGGF* and *FE* putting the Point *E* directly where the *Circumference* cuts the *Center-Line* of the place, which passes through the Point *D*. This will produce two Bastions on the City side, and three towards the *open Field*.

This *Cittadel* will be finished after the *Ramparts*,

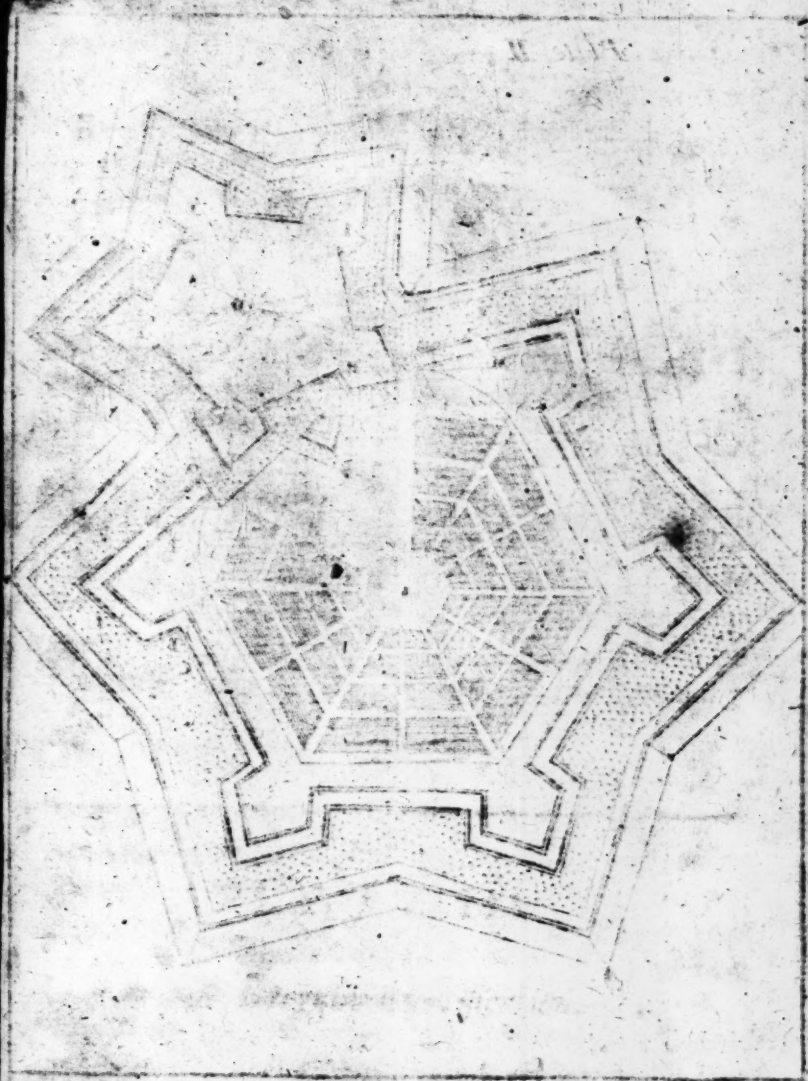
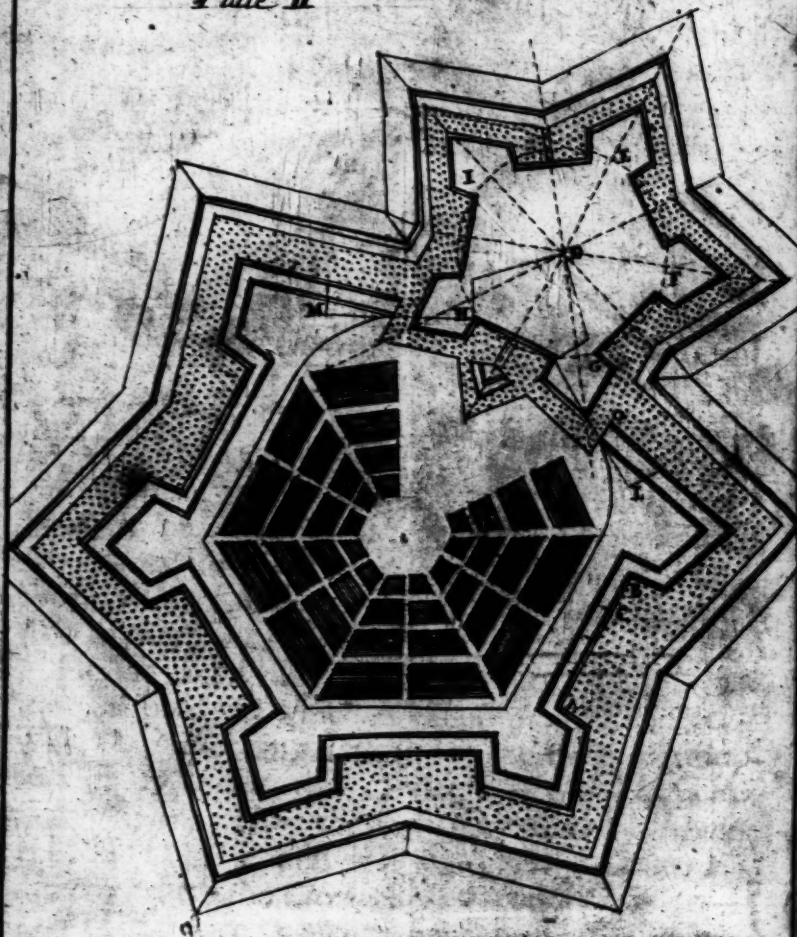


Plate II



parts, Parapets, Motes, Covert-ways, and their sloping Parapets are compleated, as also a Ravelin just before the Gate.

OBSERVATION.

Remember that you are always to throw down the Defences of the City on the *City side*, to the end that if the Inhabitants should happen to *revolt*, or the *Enemy* to become Masters of it, they may not be able to make *any advantage* of their own *Fortifications*, especially the flanks *L* and *M*, which must be ruin'd; continuing their Faces in a *Right Line*, and sloping down the *Ramparts* to the Mote of the Citadel, to the end she may be able to command the whole City.

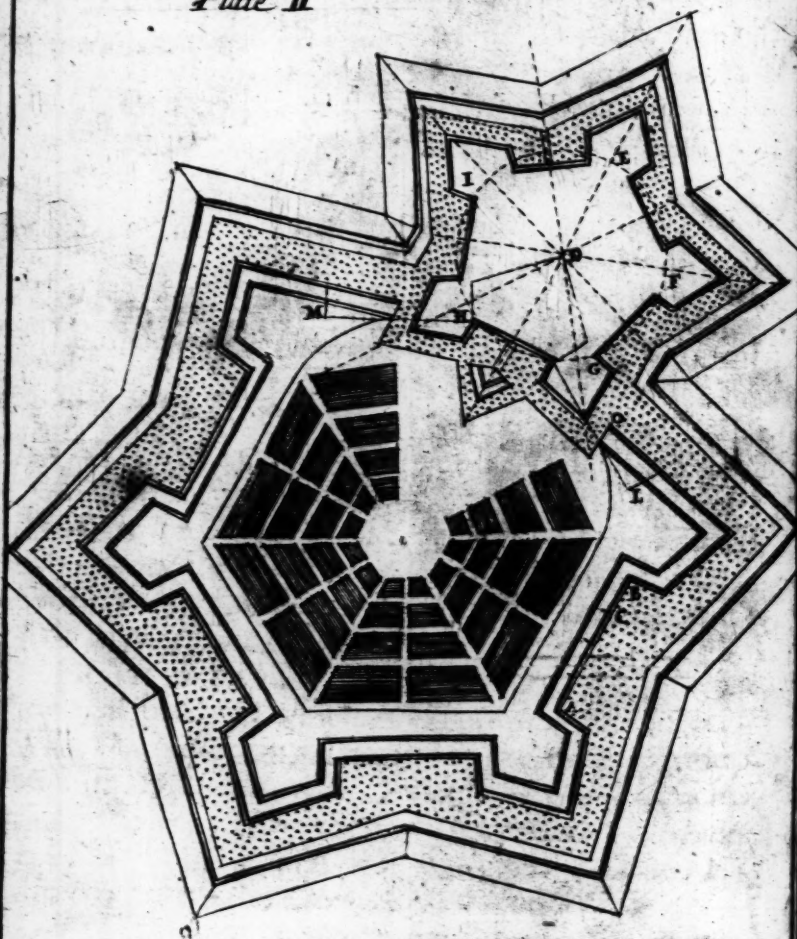
Observe moreover, That there may be a *great space* between the Mote of the Citadel, and the Houses of the City; for this space is of *great importance* to prevent any designs which the *Citizens* may have upon the Citadel, as not able to approach undiscovered, or *without entrenching* themselves.

PLATE III.

Of Irregular Fortification.

SINCE most Cities are of an irregular Figure, 'tis evident, *what great use*, or rather necessity, there is of this part. I shall comprehend all

Plate II



parts, *Paropets*, *Motes*, *Covert-ways*, and their *sloping Paropets* are compleated, as also a *Ravelin* just before the Gate.

OBSERVATION.

Remember that you are always to throw down the Defences of the City on the *City side*, to the end that if the *Inhabitants* should happen to *revolt*, or the *Enemy* to become *Masters* of it, they may not be able to make *any advantage* of their own *Fortifications*, especially the flanks *L* and *M*, which must be ruin'd, continuing their *Faces* in a *Right Line*, and sloping down the *Ramparts* to the *Mote* of the *Citadel*, to the end she may be able to command the whole City.

Observe moreover, That there may be a *great space* between the *Mote* of the *Citadel*, and the *Houses* of the City; for this space is of *great importance* to prevent any designs which the *Citizens* may have upon the *Citadel*, as not able to approach undiscovered, or *without entrenching* themselves.

PLATE III.

Of Irregular Fortification.

SINCE most Cities are of an irregular Figure, 'tis evident, *what great use*, or rather *necessity*, there is of this part. I shall comprehend all

all the matter briefly, but plainly in the following *Heads*.

First, Such *Figures* as have not their Sides and Angles equal to one another, are called Irregular.

Now 'forasmuch as the Forms of Towns are so various and subject to so many Cases, their *Fortification* cannot be comprehended under certain Rules, neither can the Principles of *Regular Fortification* be exactly observed here; It is therefore requisite that the *Engineer* make a Map or Draught of the whole, with all the *Ways, Passages, Rivers, Pools, Enclosures*, and all other matters fit to be known, and then consider what Designs and Works he shall think most fit and proper for the place. To this end let him know,

1. That the same Laws and Maxims for Regular Fortifications, stand and be in force, as for the Irregular; and that the nearer an Irregular Figure comes to a Regular, the stronger and better it is.

2. That none of the inward Angles of his Figure be less than 90 degrees; if less, then they must be changed, by making the Point, the outward Point of a Bastion.

3. That the Angles of the Bastion be not less than 60 degrees.

4. That the Line of Defence, or side of an Irregular Figure, must not be more than Musquet shot.

5. The Sides of an Irregular Figure, which is too long for two Bastions, and too short for three, may be fortified with two great Bulwarks.

6. When the side is above 70 Rod, there may be a Ravelin erected between the two Bulwarks, or a flat Bulwark built between.

7. When an Angle of the Figure is between 80 or 90 degrees, it ought to be fortified with a Horn-work.

8. All

8. All the differences between *Regular* and *Irregular Fortifications*, consists in the rectifying the *Sides* that are too short or too long, and altering the *Angles* that are too little, by cutting off from the length, what is too much, or adding to it, what is necessary, to make them in their *just* and *true proportions*, as in the *Regular*.

More Rules might be given, but there being so *much variety* in this sort of *Fortifications*, the Engineer must practise by himself, by drawing several *Plats* of *Irregular Places*, and fortifie them. And he should also peruse all the Books he can get of this Subject, as *Marolos*, *Fritach*, *Dogen*, *Dilichius*, *Travax de Mars*, &c. where he will find variety of *Examples* which will help to inform his Fancy, and rectifie his Judgment.

For the Raising the *Ramparts*, *Parapets* and other *Works*, you must observe the same *Rules*, and proceed in the same *Method* as in *Regular*, and no otherwise.

A. Is a *Regular Bastion*, and here I shall give one *Rule* to find the *Capital Line* in all irregular *Angles*, viz. At the end of each *Courtain*, as at e d, cross an Arch at c and f. and draw the line ca, which shall be the *Capital Line*, which may be about 243 Feet, a little more or less, and the *Gorges* may be one hundred forty five or 150; Feet, or thereabouts:

B. Is a *double Bastion*, that is, upon the Plane of the great *Bastion*, another *Bastion* is built upon it higher: This hath the use of a *Cavalier*, and overlooks the *Campagne*; there may be about 12 or 18 feet left between the *Paropet* of the *lower Bastion*, and the foot of the *higher Bastion*.

C. Is a *Bastion composed*, that is, when the two

interior Polygons are much unequal, then the *Gorges* will be unequal.

D. Is a *Bastion* deformed, that is, if one of the *interior Polygons* be so short that it can have no *Demi-gorge*.

E. Is a *Plat Bastion*, that is, if the distance from the Points of the *interior Polygon* be double to the usual length.

F. Is a *forked Bastion*, cut off with a *Tenaile*, that is, if the Angle of the Figure be less than 90 degrees; and because of *Water*, or some other *Accident*, it cannot be *changed*, then you may cut off the Angle, and joyn it with a *Tenaile*.

G. Is a *Bastion cut off*, that is, separated from the *Rampire*, so that its *Gorges* are in a *Right Line* with the two Points of the flanks H F.

H. Is a *Demi Bastion*, that is, such as have their *Gorge* and *Capital* equal, and its flank half of the *Gorge*.

I. Is a *Platform* upon an *inward Angle*, for the placing of *great Guns* to scour the *Ditch*.

L. Is a *Mount upon Piles* for a *Corps du Guard*, with a *Paropet*, like that of the *Outworks*, *Cannon-proof*, necessary to hinder the *Under surprises* when the Mote is frozen.

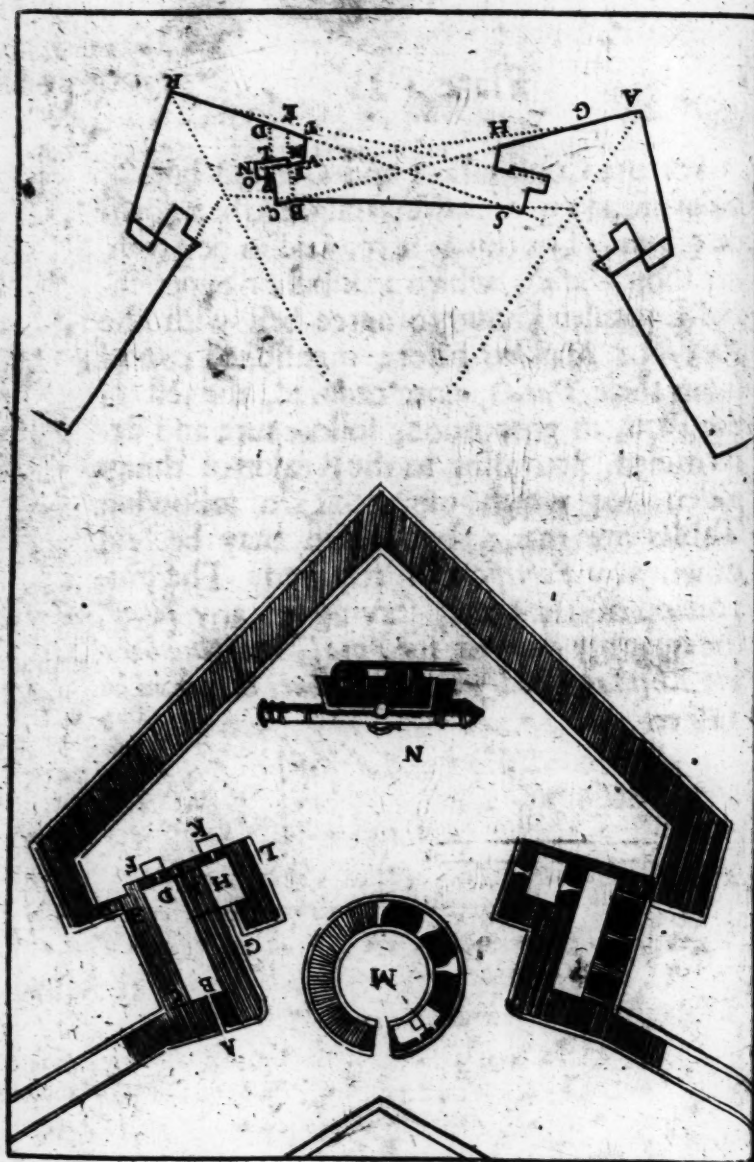
M. Is an *indented Line*, often used upon the Bank at the *Counterscarp*, or upon a *River*.

N. Is a *Counter-Guard*, or *Demi-Bastion*, built in some watry place before the main *Bastion*.

O. Is a *Scillen*, or a *Tenail* with a *Breast-work* placed in the Mote, called also a *Counter-guard*.

P. Is a *Bonnet*, that is, an advanced Work, like a *Ravelin*, sometimes placed on high Ground, sometimes on low.

pl. 1. p. 43



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Plate IV.

For the Constitution and Ground-lines of a Fortification, some things ought to be known or given; The things here, said to be given, are those *Data's*, which a skillful or experienced Engenier knows to agree best with the *Rules* or *Maxims* before mentioned; and from these *Data's*, once ordered, the rest of the *Parts*, in proportion, follow sure and determined, according to the Reason of things given; for which use the Two following Tables are made, by which may be laid down any *Fortification* required: The proportion of the *Lines*, serving for any *form*, the quantity only for the *Royal*; the *Numbers* are *Rhynd Rods*, and *Centefmes* of a Rod of 12 Feet.

XII 130 150 50 30 00 00 60 00 00

For

First Table for the Lines.

	Semidi- ameter.	Polygon Inter.	Gorge.	Capital	Flank.	Second Flank.	Courtain	Face.
IV	42	76	60	57	12	24	15	83
V	52	34	61	54	12	77	17	33
VI	62	39	62	39	13	19	18	71
VII	72	68	63	67	13	53	20	03
VIII	83	15	53	64	13	82	21	29
IX	83	70	64	10	14	05	22	99
X	103	38	63	89	13	94	24	07
XI	114	14	64	33	14	16	24	49
XII	124	77	64	39	14	29	24	85

Second Table for the Lines.

	Semidi- ameter.	Polygon inter	Gorge.	Capital	Flank.	Second Flank.	Courtain	Face
IV	38	14	53	94	8	97	20	01
V	48	8	56	53	10	26	21	03
VI	59	19	58	19	11	8	22	15
VII	68	47	59	4	11	71	23	31
VIII	78	60	60	31	12	16	24	48
IX	90	3	61	77	12	89	24	64
X	101	84	62	94	13	47	24	66
XI	113	38	63	90	13	55	24	76
XII	124	77	64	59	14	29	24	85

How

For the Angles first Table.

	Angle of the Centre.	Angle of the Figure.		Angle of the Bulmark.	Angle			Angle		
					C	F	A	A	C	F
IV	90	98	65	12	30	77				
V	72	108	72	17	00	73				30
VI	60	120	80	20	00	70				
VII	51	25	43	03	22	8	34	67	51	26
VIII	45	135	87	30	23	45				
IX	40	140	90	00	25					
X	36	144	90	00	27					
XI	32	147	22	00	28	18	11	61	12	11
XII	30	150	90	00	30					

For the Angles second Table.

	Angle of the Centre.	Angle of the Figure.		Angle of the Bulmark.	Angle			Angle		
					C	F	A	A	C	F
IV	90	90	60	15						00
V	72	00	69	19						30
VI	60	00	75	22						30
VII	51	25	43	09	14	38	34	65	21	25
VIII	45	00	82	26						45
IX	40	00	85	27						30
X	36	00	87	28						30
XI	32	38	15	29	19	05	60	40	55	
XII	30	150	50	30	00	00	60	00	00	00

How to Delineat any Fort, according to the Proportions in these Tables.

1. To make a *Square Figure*, a *Pentagon*, *Hexagon*, *Heptagon*, &c. Having no *Scale* or *Sector*, then you may make a *Scale* large or small, as you design to make your *Polygon*; dividing it into ten equal Parts, and every 10th. into ten, then the *Scale* will be divided into 100 equal parts, then supposing each part subdivided into 10, so the whole *Scale* will be 1000. *Plate 4. Fig. 1.*

2. To delineat a great *Royal*, according to the proportions in the first *Table*, take out of that *Table* the *Semidiameter*, or *Radius*, of that *Polygon*, which you intend to draw; (for Example, an *Hexagon*;) which is in the *Table*, 62. 39. that is, 62 *Rods*, 3 *Foot*, and 9 *tenths* of a *Foot*, or 62 *Rods*, and 39 *Centesmes* of a *Rod*, which take off from the *Scale*, and describe a *Circle*, as 1, 2, 3, 4, 5, 6. as in *Fig. 2.* *Plate the 4th.*

3. Take off the *Scale* the length of the interior *Polygon*, 62. 39. or side of the *Figure*, which

which the *Table* shews that distance, apply it to the Circumference, 4, 5, 6, 7, 8 or 9 times, as the *Polygon* is that you intend to draw, which is 6 times in the *Hexagon*; draw the blind lines from the *Centre*, and through the several Divisions 1, 2, 3, 4, 5, 6, and Lines from 1 to 2, and from 2 to 3, and from 3 to 4, and from 4 to 5, and from 5 to 6.

4 Take off from the *Scale*, the *Capital Line*, 18. 73. as in the *Table*, and set it off at all the *Angles* of the *Ground-plot*, viz, from 1 to 2, and from 2 to 3, &c.

5. Take the length of the *Gorge*, 13. 79. from the *Table* upon your *Scale*, and set it off from 1 to 7, and from 6 to 7; and on the two points 7 and 7, raise perpendicular *Lines*, as 7, 8. and 7, 8.

6 Take off from the *Table*, the length of the *Flank*, viz. 10. 07. upon your *Scale*, and set it off from 7 to 8.

7. Draw the *Face* from the uppermost part of the *Capital Line* d. to the uttermost part of the *Flank* 8. and so for the rest of the *Lines*, they are easily set off, and transferree from these, and so the Draught is finished.

Thus

Thus you may by these *Tables*, with a *Scale* of equal parts, delineate any regular *Figure*, two several ways, according to the first or second *Table*, and by the *Rule of Three*; these *Tables* may serve for any Proportions.

But these *Data's* may be varied without prejudice to the *Maxims* of *Fortification*, and the *Constitution* of the *Ground-lines* will be various, according to the *Experience* and *Opinions* of several *Engeniers*: Therefore I shall shew the *Constitution*, and making the principal *Ground-lines* of any *Fortification*, in several ways, use by other more famous and modern Authors.

And First, of the *Dutch* or *German* ways, who, although they have filled the World full of Books, of several ways of *Fortification*, yet *Maralois*, *Fritach*, *Goldman*, and *Dogen*, all agree, to make the *Courtain* 36 *Perches*, or 432 *Rhinland-feet*; the *Face* 24 *Perches*, or 288 of the aforesaid *Feet*, so that the proportion of the *Curtain*, to the *Face*, is as 3 to 2. the *Angle* forming the *Flank*, is always 40 *Degrees*; the *Angle* of the *Bulwark* is half the *Angle* of the *Figure*, increased with 15 *Degrees*; *Goldman*, *Marolois*, and *Fritach*, agree in the *Angle* of the *Bulwark*; but *Dogen* makes the *Angle* of the *Bulwark*, equal to $\frac{7}{8}$ of

of the *Angle* of the *Figure*; so that all the *Data's* are very near the same, with those the Author hath laid down before.

For *English* Authors, I shall only mention Mr. *Norwood*, who in his *Maxims* differs very little from our Author; the *Dutch Fortification* being then most used. And Sir *Jonas Moor*, who was an able *Mathematician*, and well experienc'd in this Art; after he had shewed the several ways of all Modern *Engeniers*, sayeth, That the interior *Polygon* is most agreeable to Practice, being 1000. to take 333 *Feet*, for the *Capital* 200, for the *Gorge* and *Flank*, and 600 for the *Courtaine*, so that he agrees with *Manassen Mallet*, Author of *Travax de Mars*; and, for a general Rule, take, saith he, $\frac{1}{3}$ of the interior *Polygon*, for the *Capital* $\frac{1}{3}$ of it, for the *Gorge* and *Flank*, where there is no second *Flank*, and where the *Flank* and *Capital* stand at *Right Angles*.

The Emperor, *Ferdinand III.* sets down (as *Schoius* that learned *Jesuite* layth) an *Universal* way to lay down the *Lines* of any *Fort*, viz. to divide the interior *Polygon* into 22 parts; of these, take 5 for the *Gorge*, 8 for the *Capital*, and 4 for the *Flank*; or supposing the *Polygon* to be divided into 1000, the *Capital* is 363, the *Gorge* 227, the *Flank* 181,
this

this proportion is good, and for such as are not well skilled in *Trigonometry*, may very well be used.

Of the Italian Fortifications.

First, of *Signior Pietro Sardi*, who makes the interior *Polygon* 800 *Venetian Feet*, his *Gorges* and *Flanks* 150, and determines the *Face* of the *Bastion*, by the *Line* of *Defence*, razing which in a *Square*, or *Pentagon*, falls upon the 10th. part of the *Courtain*; in a *Hexagon*, on the 4th. part; in a *Heptagon*, *Ottagon*, *Enneagon*, on the 3^d. part, in all above on the half, to lay this down: suppose an *Hexagon*, whose interior *Polygon* is 1000, then 187 will be the proportion for the *Gorges* and *Flanks*, which prick off, from 4 to 7, and from 5 to 7, and raising a *Perpendicular* at 7, set off the same distance, from 7 to 8, for the *Flanks*; then for the *Face a. d.* divide the *Courtain* 7, 7, into 4 parts, and set off $\frac{1}{4}$ from 7 to e. then lay a *Ruler* from e, to b, and draw a, b, for the *Face*; but had it been *Square* or *Pentagon*, then 7 c. had been $\frac{1}{5}$ of the *Courtain*, if it had been an *Heptagon*, *Ottagon*, *Enneagon*, then 7, e, had been $\frac{1}{6}$ of the *Courtain*, if above $\frac{1}{4}$ from the opposite *Flank*.

2. Ten-

2. *Tenfini*, in small Forts above the *Pentagon* makes the *Gorge* and *Flank* equal, and both a 7th. part of the *interior Polygon*, and the *Face* in all *Figures* one 3d. of the said *Polygon*. To draw this: Suppose a *Hexagon* whose *interior Polygon* 5, 6. is divided into 1000. the *Gorge* and *Flank* will be as in the *Table 143*. the 7th. part, which set off from 5 to 7. and from 6 to 7. and raising 7, 8. at *Right Angles*, set the same distance from 7 to 8. then take $\frac{1}{3}$ part of *p. p.* and setting one foot of the *Compasses* in 8. cross the *Capital Line* in *d.* and draw 8. *d.* which do to every *Bastion*, till all be finished.

Of the French Fortifications.

The chief of these are *M. de la Mont*, and *M. Mallet*, both these divide the *interior Polygon* into 5 parts, and take one for the *Gorge*, and also divide the *interior Polygon* into 3 parts, and take one for the *Capital Line*; only *De la Mont* takes $\frac{1}{4}$ of the *Courtain* for the *Flank*, and *M. Mallet* makes the *Angle* of the *Flank* and *Courtain* to be 98 degrees, (leaving no second *Flank*,) and so lays the *Courtain* more open for use, and yet not so much as to subject it to ruine of the *Besiegers*.

* *

1

I must not forget *D. Ville*, and *Furneirs*, who divide the *interior Polygon* into 6 parts, one for the *Demigorge* and *Flank*, both being equal, and at *Right Angles*, if the *inferior Polygon* be 1000, the *Gorges* and *Flanks* will be 166.

By this *Table* following may be laid down any *Fortification*, according to these *Authors*.

	<i>Capital</i>	<i>Gorge</i>	<i>Flank</i>	<i>Courtain</i>
<i>Fritach.</i>	400	220	200	560
<i>Dogen.</i>	358	167	200	666
<i>Emperor.</i>	363	227	181	546
<i>P. Sardi.</i>		187	187	626
<i>Tensini.</i>		143	143	714
<i>G. Maria.</i>		125	138	750
<i>De la mont.</i>	333	200	150	600
<i>Manesson.</i>	333	200	200	600
<i>Fren. Conquest.</i>		200	240	600
<i>Furnoir, &c.</i>	228	166	166	666

In this *Table* you have the *Proportions* for the *Capital*, *Gorge*, *Flank*, and *Courtain*, supposing the length of the *interior Polygon* 1000
Eng-

English Feet, according to these several Authors. But if the *interior Polygon* be less than a 1000, the *Proportion* in this and the former *Tables* may be reduced to any other *Polygon* required, by multiplying the length given by any of those *Numbers*, and cutting off the 3 last places. *Example.* A *Polygon* given is 750, what shall be the length of the *Capital*, *Gorge*, *Flank*, and *Courtain*, according to any of the aforesaid Authors. For *Example*, to *De la Mont*. multiply 750 by 333, gives 249 Feet for the *Capital*, so for the *Gorge*, then multiply 750 by 200. and there is 150, for the *Gorge*, then multiply 750 by 150, and there will be 112 for the *Flank*, and after the same manner 450 for the *Courtain*. And thus you may proportion any of these Authors to any *interior Polygon*, which must not exceed 800, nor be less than 500, for if less, your *Fort* will be fit only for *Cittadels*, or *Field works*, but if more than 800 Foot, too big for a *Fort-Royal*, and must be well stored with *great Guns*.

I shall mention only Count *Pagan's* way which was once much approved of here in *England*; he was indeed a great *Mathematician*, and well experienced by many *Campagnes* and *Seiges*, he works by the *exterior Polygon*, and his chief *Proportions* are in the following *Table*. Ex-

Exterior Polygon.	1200	1080	1000	960	820	720	600
the half.	600	540	500	480	410	360	300
Length of the	425	364	334	304	375	234	164
Courtain.	212 $\frac{1}{2}$	182	167	152	137 $\frac{1}{2}$	117	82

Length of the Perpendicular.	180	180	180	180	150	144	138
Length of the Face.	364	336	308	288	242	222	206
Complem. of the Line of Defence	222	192		162	162	162	90

To draw a *Fort* after this way, draw the exterior Polygon *C. D.* divide it into two equal parts at *E.* which suppose 600 each, and raise the Perpendicular *E. L.* upon which set off the length of the Perpendicular in the *Table*, viz. 180. which will terminate in the Point *F.* then from either Point *D.* and *C.* draw Lines to *F.* viz. *C. F.* and *D. F.* then look in the *Table* for the length of the Face, viz. 364. which set off from *C.* to *I.* and from *D.* to *K.* then (measure out the length of the *Courtain*, viz. 212 $\frac{1}{2}$ from *L.* to *H.* and *G.* or else) take out the Compl. of the *Line of Defence*, viz. 217. and set it off from *F.* to *H.* and from *F.* to *I.* then from *H.* and *I.* and from *G. K.* draw the *Flank*. Thus following the same Method, from each *Base* of exterior Polygon, you may draw any Fortification

tification; but to fortifie a Square, the Proportions must be altered thus.

Base or exterior Polygon	600	550	640	520
Perpendicular ———	161	146	173	137
Face —————	364	326	384	296
Compl —————	222	211½	243½	211½

And may be drawn by the forementioned Directions.

Having now set down the several ways for laying down the Fundamental Ground-line, from the most considerable Engeniers of this Age. I shall here shew how to draw out Mechanically, in the Field, any Regular or Irregular Fortification, either from the Exterior or Interior Polygon, according to Count Pagan.

And first, from a Pentagon to a straight Line from the exterior Polygon.

The Base, or exterior Polygon a. c. given, divide as in Plate the 4th. into equal parts in
the

the Point *b.* from the Point *b.* raise the Perpendicular *e. b.* of a sufficient length, then divide *a. b.* the half Base into 3. 6. or 9. equal parts, and take $\frac{1}{3}$ thereof for the Perpendicular *b. d.* so is *d.* a Point, through which draw the Line *a. d.* and *d. c.* which done, divide the Perpendicular *b. d.* into 8 equal parts, and make *d. h.* and *d. f.* equal to 9 of those parts, then from the points *b.* and *f.* let fall the Perpendiculars *b. g.* and *f. p.* till they cut the Lines *a. f.* and *c. h.* in the Points *g.* and *p.* then join the Points *a. g. h.* and *f. p. c.* and so you have *a. g.* and *c. p.* for the two Faces *g. h.* and *f. p.* for the two Flanks, and *b. f.* for the Curtain of the Fortification, Plate 4. Fig. 3.

From a Square to a Pentagon.

The Method of this is the same as the former, only instead of dividing the half Base *a. c.* into 3. 6. or 9. and taking the $\frac{1}{3}$ thereof for the Perpendicular, you must here divide the half Base *a. c.* into 15 or 30 lengths, and set off 4 or 8 for the Perpendicular *d. b.* and instead of dividing the Perpendicular *d. b.* into 8. you are to divide it into 5, and of these parts, you are to set off

7 upon both the *Lines d. f.* and *d. h.* and this is all the difference.

Or note, that having raised your *Perpendicular*, take any measure whatsoever, be it *Pole, Staff, Line* or *Stake*, and mark out 3. 6. 9. 12. 15. 18. 21. &c. upon the *Line a. c.* to the *Point l.* upon which *Point* erect a *Perpendicular l. k.* equal to $\frac{1}{3}$ of *a. l.* so is *k.* a visual *Point*, through which is to be drawn the *Line a. f.* cutting the *Perpendicular c. e.* in the *Point d.* and *e.* a visual *Point*, through which is to be drawn the *Line c. h.* then proceed as before directed for the *Pentagon*; but for the *Square* instead of marking out 3 lengths upon the half *Base*, you must here mark out 15 for the *Line a. l.* and instead of $\frac{1}{3}$ you must allow 4 of those Parts for the *Perpendicular k. l.*

To do this by the *interior Polygon*, and that from the *Square* and *Pentagon*, to a *Right Line*, let the *interior Polygon* given be *A. B.* which divide into 12 parts, and make *d. e.* $\frac{1}{12}$ and *a. i.* $\frac{2}{12}$ for a *Square*, and *a. k.* $\frac{4}{12}$ for a *Pentagon*, *p. k. l.* and *p. i. g.* right *Angles*, and proceed as directed before, Plate the 4th. Fig. 4.

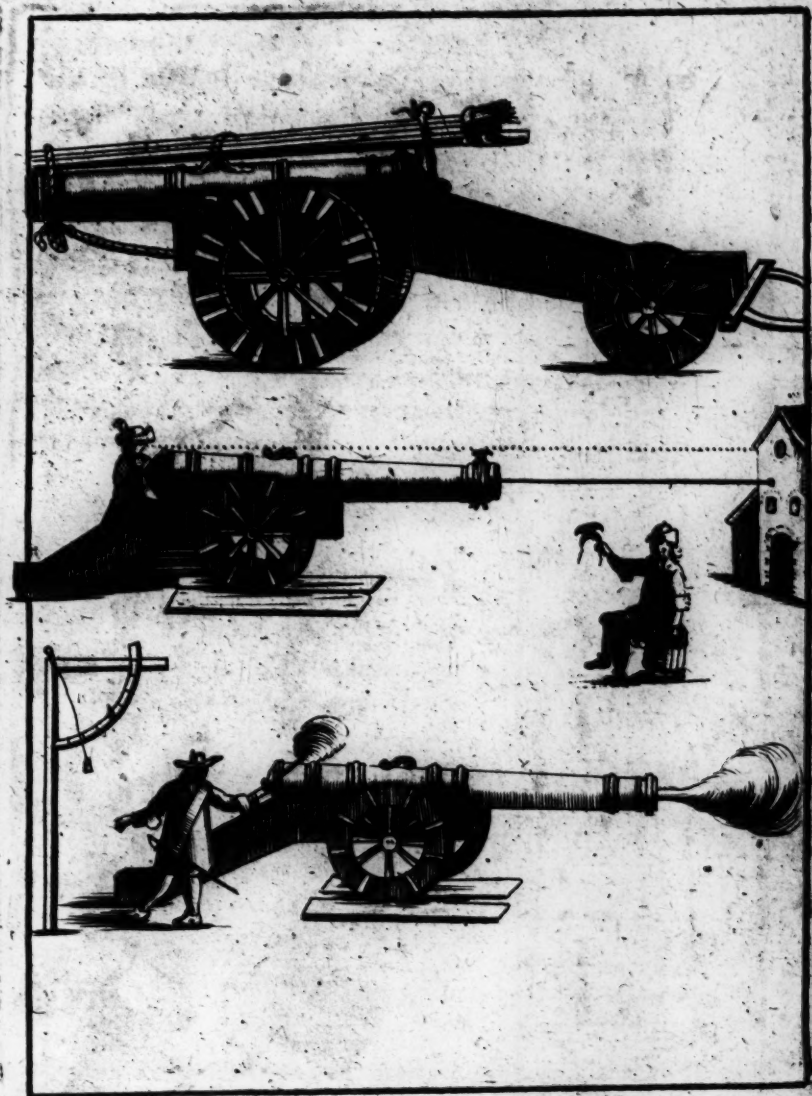
Note

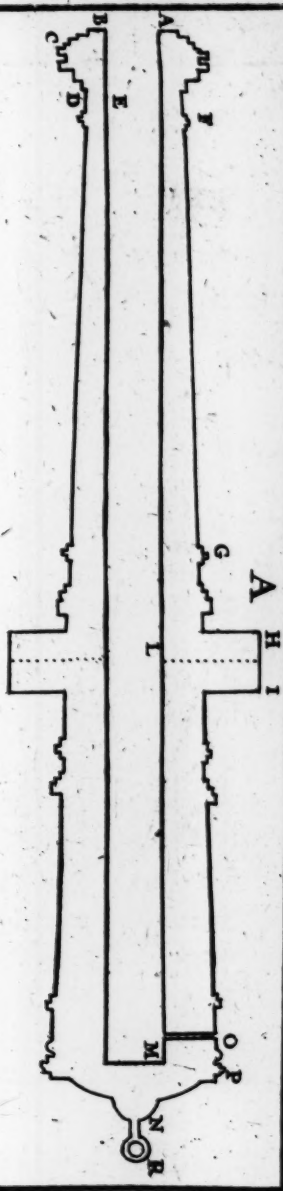
Note also that the *exterior Polygon* should be about 1150 Feet, never less than 1024, nor more than 1280, that to the *Line of Defence*, may not be too short, nor longer than *Musquet-shot*, and that the *Angle* of the *Bastion* be not less than 60 degrees; but where either the *Scituation* of the place, or the old *Walls* or *Rampiers* of a Town will not admit any such equality either of *Bases* or *Angles*, then the *Engenier* may either open or sharpen his *Angles*, or lengthen or shorten his *Lines* as necessity shall require.

Plate the 5th.

Here note that the *Encampment* is figured with *Paces*, and the *Profiles* with Feet.

Of









OF
GUNNERY.

Plates IV. V. VI. VII. VIII.

*Of the Names of the Principal Members of
a Piece of* **ORDNANCE.**

1. Defin. **A** CANNON is a long, round Body, either of Brass or Iron, formed and made hollow by Art, and proportion, to offend afar off, with a Ball of Iron, Stone, or any artificial Substance, charged with Gun-Powder in its charged Cylinder, which being fired, in an instant performs its desired Effect. This Machine was invented by an *Englishman*, and first put in practice by the *Venetians* against the *Genouises* at *Chiexza*, Anno 1376.

2. The superficies of the Metal, is the outside; round about the Piece.

3. The Body is the substance of the whole Mass of Metal.

4. The Chase is the concavity of the Piece, in which they put the Charge.

5. The Muzzle is the extremity of the Chase by which you load and unload the Piece.

6. The Calibre is the Diameter of the Muzzle or Mouth.

7. The Touch-hole is that little *Vent*, which passeth from the *Convex Superficies*, to the very Chamber of the Piece, made to give fire to the Powder within; that which encloseth the extremity of the Chase about the Touch-hole, is called the Breech or Cowl.

8. The *Cascabel* is the Pommel at the Breech or Cowl.

The Tunnions are pieces of Metall fixed unto the exterior superficies of the Gun, on which he moves in the Carriage.

The Body of the Piece, is that which is comprehended betwixt the Center of the Tunnions and the *Cascable*.

The vacant Cylinder is comprehended betwixt the Center of the Tunnions and the Muzzle.

The *Freer* or Muzzle-Ring, is that thick *Cor-nish* which incompasseth the *Convex Superficies*, or the Piece.

The Dispart-line of the Piece, is the difference betwixt the *Semi-diameter* of the Muzzle and Base-Ring.

The *Vent* of the Piece is the difference betwixt the Diameter of the Shor, and the Mouth of the Piece.

The Chamber, or charged Cylinder, is that part of the Chase towards the Touch-hole equally large,

nor narrower in one place than in another, and doth contain the Powder and Ball.

How to know the different Fortification of a Piece of Ordnance.

In fortifying any Piece of Ordnance, there are three degrees observed, as first, *Legitimate Pieces*, which are those that are ordinarily fortified; secondly, *Bastard Pieces*, which are such whose Fortification is lessened; thirdly, *Double fortified Pieces*, or extraordinary Pieces.

The Fortification of any Piece of Ordnance is accounted by the thickness of the Metal at the Touch-hole, Trunnions, and at the Muzzle, in proportion to the Diameter of the Bore.

The *Legitimate Pieces*, or the ordinary fortified Cannons have $\frac{3}{4}$ at the Touch-hole, $\frac{3}{4}$ at the Trunnions, and $\frac{3}{4}$ at the Muzzle, of the thickness of the Bore, in thickness of the Metal. *Bastard-Cannons* or lessened Cannons have $\frac{1}{2}$ at their Touch-hole, or $\frac{1}{2}$, and $\frac{1}{2}$ at their Trunnions, and at their Muzzle. The *Double fortified Cannons* have full one Diameter of the Bore in thickness of the Metal at the Touch-hole, and $\frac{3}{4}$ at the Trunnions, and $\frac{3}{4}$ at their Muzzle. Now all double fortified Culverins, &c. are $\frac{1}{2}$ at the Touch-hole, $\frac{1}{2}$ at the Trunnions, and $\frac{1}{2}$ at the Muzzle, and the Ordinary fortified Culverins, are fortified every way as double fortified Cannons, and lessened Culverins as Ordinary Cannons in all respect.

*How to know how much Powder is fit for Proof,
and what for Service for any Piece of Ord-
nance.*

For *Cannon* take $\frac{1}{4}$ of the weight of their Iron Bullet of good Corn Powder for Proof, and for Service $\frac{1}{5}$ the weight of the Iron Bullet is sufficient, especially for Iron Ordnance, which will not endure so much Powder, as Brass ones will receive by $\frac{1}{4}$ in weight. For *Culverins* allow the whole weight of the Shot for Proof, and $\frac{2}{3}$ for Service. For *Sakers* and *Falcons* take $\frac{1}{4}$ of the weight of the Shot, and for lesser Pieces the whole Weight may be used in Service, until they grow hot; but then there must be some abatement made at discretion, and take $\frac{1}{3}$ of the Weight of their Iron Bullet for Proof.

To know what Bullet is fit to be used in any Piece of Ordnance.

The Bullet must be somewhat less than the Bore of the Gun, that so it may have vent in the Discharge: so Authors affirm, that $\frac{1}{4}$ of an Inch less than the Bore, will serve all Ordnance; but this vent is too much for a *Falcon*, &c. and too little for a *Cannon*; therefore I approve them not, but commend Mr. *Phillips's* proportion (set down in his *Mathematical Manual*, page 165) to your Use, which is to divide the Bore of the Gun into 20 equal parts, and let the Diameter of the Bullet be $\frac{19}{20}$ thereof.

Of the Qualification of an able Gunner, and necessary Operations before Shooting, and in Shooting.

A Gunner ought to be a Man of Courage, Experience, and Vigilant; he ought to have good skill in Arithmetick, to know the extraction of the Roots, &c. He ought to have skill in Geometry, to take heights, distances, &c. to know the Divisions and use of his Circle, Quadrant, and Quadret; to know how to level and to lay Platforms, and to raise Batteries. He must know the Names of all sorts of Ordnance, their Weight, the Height of the Bore, the height and weight of their Shot, the length and breadth of their Ladles, how much Powder to use for Proof and Action; the Shots Level, and the Shots Random; He must know the Names of all the Members of a Piece of Ordnance; he must also know the length, thickness and breadth of all manner of Carriages, and must know all the parts thereof, viz. the Cheeks or Sides, the Ax-tree, Spokes, Nave, Hoops, Transoms, Bolts, Plates, Drawing-Hooks, the Clout, the Hole for the Linspin, the Shafts, the Thill and Thill-Bolt, the Forelock and Forelock Keys, Cap-squares, the Forelock pins and Chain, the Pintle and Bolt-hole, Fellows, Nails, Fellow-bars, Stirrups, the Ruts of the Wheel, Dowledges, Bed, Conies, Levers, Handscrews, &c. He must also know how to make his Ladles, Spunges, Cartridges, whether of Paper, Vellum, or Canvas, and to have by him Farmeres of all sorts, Sheepskins undrest to make Spunges, Powder, Shot, Needles,

dles, Thread, Paste and Starch, Marlin, Twine, Nails, Handspikes, Crows of Iron, Granado-shells, and Materials for Composition, Fasces, Budg-Barrels, Cannon-Baskets, &c. These being general things he is to know, and at all times to have ready by him, and he is more particularly to know these following parts of his Art, as,

How to Tertiate, Quadrate, and to Dispart a Piece of Ordnance.

1. To *Tertiate* a Piece, is to find whether it hath its due thickness at the *Trunnions, Touch hole* and *Neck*, and if the *Trunnions, Touch-hole* and *Neck* are in its due order, and the *Chase* streight.

2. To *Quadrate* a Piece mounted, is to see whether it be directly placed, and equally poized in the Carriage; which is known by finding in the *Convex Superficies* of the Base and Muzzle-Ring, the Point which is *Perpendicular*, over the Soul of the Piece, which may be found by the Gunners Instrument, called a *Level*, an Instrument whose use is so vulgarly known, that it needeth not my Explanation.

3. To *Dispart* a Piece, is to fix, or elevate on the Convex-point of the Muzzle-Ring, a Mark as far distant from the *Cylinder*, or Soul of the Piece, as is the Point of the Base-Ring; to the end, that the *Visail-ray* which passeth by these Marks, may be parallel to the *Chase, Soul* or *Cylinder* of the Piece. Now the *Dispart*, i. e. the difference of the *Semidiameters* of the *Cornishes*, may be by a pair of *Calliper Compasses* attained, which found, place on the top of the *Cornish Ring*, near the Muzzle, over the middle of the *Inferior Cylinder*.

To know how far any Piece of Ordnance will shoot, &c.

As to the several shootings in *Artillery*, Authors differ much in their Judgments and Opinions, but they all unanimously agree, that the Ball being shot forth, flies through the Air, with a Violent, Mixt and Natural Motion; describing a *Parabolical line*, in whose beginning and ending, are lines sensibly streight, and in the middle curved; In the beginning the imprest force driving forward by the Fire, the natural gravity of the Ball doth describe a *Right Line*, called the *Direct Line*, or Ranges of the Balls Circuit.

In the middle that force diminisheth, and the *Natural Gravity* prevaieth, so that it describeth a curved line, called the *Balls middle Helical* or *Conical Arch*; In the end, the *Natural Gravity* overcoming the imprest violence, (which becomes altogether weak and faint) describes a new right line, called the *Balls declining line*, in which the Ball tends towards the Center of the Earth, as towards a Place natural unto all heavy bodies. See *Figure 92*. These motions are somewhat longer, according as the Piece is mounted from the Level unto the Angle of 45° deg. which is called the *Utmost Random*. The Elevation of which, is regulated by the *Gunner's Quadrant*, the use of which Instrument is so generally known, and by so many Authors, fully explained, that I here crave leave to omit it. But take these for general Rules.

1. That a Shot at Right Angle, strikes more violent and furiously than at Oblique Angles; therefore Gunners use when they are to batter down a Tower, Wall, or Earth-work, to shoot point blank at the object, Tire by Tire; by discharging all the Pieces in Battery against the self same object, in the same instant, holding it for a Maxim, that ten Cannons discharged together, do far more Execution, than discharged one after another. Now at Oblique Angles they shoot either Cross-ways, or by rebounding.

2. That the speediest way to make a Breach in a Wall, &c. Is by shooting at the Object from two Batteries, which ruins far more speedily than by striking the Object with one Battery at Right Angles, although that one Battery hath as many Cannon as the other two hath.

3. That if you were to Batter a flank covered with an Orillion, (which because you cannot possibly Batter it right forward) you must therefore of necessity batter it obliquely, by way of Rebounding, thus: Chuse a fit place in the Courtain to be your object, on which you may play with your Battery obliquely, so that by a rebound the shot may leap into the flanks, holding for a Maxim, in this operation, That the Angles of Incidence and Reflection are equal.

Of shooting in Mortar-Pieces.

A Mortar-Piece is a short Piece, with which they shoot Bombs, Granado-shells, Stone-Balls- &c. not by a Right Line, but from a Curved, from on high, so that it may fall where it should, be desired: Now this Mortar is placed in the Carriage,

Bombs are great hollow Balls of Iron or Brass, in which are put fine sifted Gunpowder, which by a Fuse, they proportion to them a due Fire, that so they may break assoon as they fall amongst the Enemies. These Fuses are small Trunks of *Wood*, *Tin* or *Iron*, filled with a prepared Composition for that purpose. *Granadoes* are of the same form with *Bombs*, only smaller, and are many times cast by hand, and are made of *Iron*, *Brass*, *Glass* or *Earth*. Now in order to the well shooting in those kind of *Machines* called *Mortars*, 'tis requisite to observe these following Rules: as

1. That before you make a Shot at any place, you find the distance thereof from your Mortar.

2. That the Bombs or other Bodies that are to be shot, be of equal weight, otherwise the Shots will fail.

3. That the Carriage in breadth be always on a Level, and without any descent, that so it may not leap in discharging fail.

4. That the Powder with which the Mortar is loaded be always of the same force and weight.

5. That the charge of the Mortar, as well in Powder, as in Wadding, be always rammed in with blows equally heavy, and of equal number.

6. That the Wadds be always either of *Wood* or *Tompeons*, or else of *Oakum*, for the strongest drives it farthest.

7. That the Fuses be newly made, in those days that they are to be used, and that they be made of a Composition proportionable to the Range that the Shot shall make in the Air, so that the Bomb may break in the very moment it falls; which Composition must be such, that though it fall in the Water, yet

not to extinguish, but the Bomb there to break.

Now before we proceed any farther, I think it necessary, to shew how to compose your Ingredients for your Fusee.

To make Fuses for Bombs, &c.

The Composition for Bombs must be of a slow motion, that so time enough may be given to throw either Bombs, Granadoes, Fire-Balls, Thundring Barrels, &c. They are compounded of these Ingredients, thus: Take a pound of Gun-powder, $\frac{1}{4}$ of Sulphur, $\frac{1}{8}$ of Saltpeter, well beaten, dry and sifted separately, then mix it and make up your Fuse hereof. Or, Take Powder of Benjamin and small-Coles, all well beaten and mixed together with some Oil of Piter, and so fill the Fusee therewith.

Now the use of Mortar-Pieces, being for the most part to shoot up at Random, therefore the Randoms of these Pieces is very necessary to be known. Therefore I have hereunto annexed a Table of Randoms for the twelve Points of the Quadrant, calculated by Diego Uffano Zurphen, and to be found in his Works, printed 1621.

A Table

A Table of Randoms for Mortar-Pieces, to the twelve Points of the Gunners Quadrant, calculated by Diego Ulfano Zutphen.

583 570 534 468 377 248 100

6 5 4 3 2 1 0

.

6 7 8 9 10 11 12



583 570 534 468 377 248 000

Now suppose the Mortar to be placed at \odot , the Pricks in the middle line representeth the several *Randoms*, numbered with the Degrees of the *Quadrant*, forward and backward, unto which the several *Randoms* are set; so you see that the *Mortar* being levelled point blank, throweth the Bomb 100 Paces, if the Mortar be mounted one Point, it throws the Bomb 248 Paces, &c. until 'tis mounted to the 6th. Point, 583 Paces, which is the utmost *Random*. Now if the *Mortar* be mounted higher to 7, 8, 9. &c. Points, the *Randoms* decrease again, as before they did increase, as you see in the Table.

But in these latter *Randoms* there lieth a great mistake, as shall be made appear. For if as they are distant from the sixth Point, you make them equal unto one another, then the *Random* of the 0 Point, or the *Level Random*, which is 100 Paces from the Mortar. Now it is contrary to all Art and Reason to think that if the *Mortar* be elevated to the 12th. Point, i. e. bolt upright, it should shoot the Bomb 100 Paces from the *Mortar*; no, it cannot be, but according to all Reason, the Bomb must fall down either on. or near the *Mortar*, and not 100 Paces distant, as is most erroneously conceived.

The foregoing Rules and Precepts are necessary to be known by every Gunner, who intends to be serviceable to his Prince and Country.

The

*The Exercise of the Foot-Grana-
deer's, and Explanation, begin-
ning with the Fire-Lock.*

OBSERVATION.

Observe that Granadeers standing in a Body with Musketeers, must make only the same Motions as they do, because they meddle not with their Granades, or Bayonets. The Facings are here omitted, being the same with the Muske-
teers.

*Granadeers take heed to Exercise your
Fire-Locks.*

1. **J**Oyn your right hand to your Fire-locks : as in the Exercise of the Musket.
2. Poise your Fire-locks : as in the Musket.
3. Rest your Fire locks : as in the Musket.
4. Cock your Fire-locks, Guarding at the same time : as in the Musket.
5. Present : as in the Musket.
6. Fire : as in the Musket.
7. Recover your Arms : as in the Musket.
8. Handle your Slings : With both hands turn the Fire-lock, the lock outwards, holding it with your right hand before your body, the Thumb upwards, draw with your left hand your Sling quickly in an equal line, with your Fire-lock to the left side, the
I Thumb

Thumb upwards, standing thus till the next Command. 9. *Sling your Fire-locks*: Bring your Sling with your left hand just above your right shoulder, at the same time bring your Fire-lock with your right hand under your left elbow, bring the Sling over your head, draw the Sling with your left hand in letting loose the right, that the Fire-lock hang upon your right shoulder, with the muzzle up, and the butt end downwards; then let loose your left, and let it hang down as the right hand. 10. *Handle your Matches*: Bring both hands readily with half outstretched Arms before your Body, about the height of your shoulder, at the same time, take with your right hand, the lowest end of the match, your thumb under, and the two foremost Fingers above, then bring it over the back of your hand between your thumb and your two fore-fingers, then thrust out the left hand with the match quickly forwards, letting at the same time the right hand hang down upon the bag. 11. *Handle your Granades*: Keep your left hand as before, nimbly facing on the left foot to the right, at the same time lifting up the cover of the Grenade Pouch with your right hand, take the Grenade and bring it with an out stretched arm, in a straight line with your left hand, your thumb against the Fuse, standing in the same Posture. 12. *Open your Fuse*: Hold your left hand still, bringing the Grenade to your mouth

mouth with your right, open the Fuse with your teeth, and thrust it nimbly from you to its former place. 13. *Guard the Fuse with your Thumb.* 14. *Blow your Matches:* Bring up the Match before your mouth, blow it off hard and quick, and thrust it at the same time to its former place. 15. *Fire and Deliver your Granades:* With the left hand meet the Grenade a little downwards towards the right side, unconstrained, to which side your face and body must be a little turned, fire the Fuse, bringing back the right hand a little, with the Grenade, deliver it with a stiff arm, stepping forward with the right foot equal with the left, bringing down the left hand with the match to the former place, letting the right hand hang down by the Pouch, so continuing till the next Command. 16. *Return your Matches:* Bring both your hands before your body, as in *Explanation* 10. Take the match, put it in its place, then let both hands hang down by your body. 17. *Handle your Slings:* Take hold of the midst of the Sling with your right hand, and with the left about a hands breadth, from the Fire lock below, lift up the Fire-lock with the left, so that the elbow comes through under the Fire-lock, lying on the arm and shoulder; let go the left from the Sling, and take hold of your Fire-lock about a hands breadth above the lock, let the stock come to lie between the thumb and the two foremost fin-



gers, your arms stretched with the butt end before you. 18. *Porse your Fire-locks*: With the right hand bring the Sling over your head, and with the left your Fire-lock, and with half stretched arms mount it, the barrel turned forwards, let go your right hand from the Sling, turn your Fire-lock with your left hand, that the lock come outwards, and at the same time put your right hand under the cock, the thumb upwards, then thrust the Fire-lock quickly from you, let go your left hand, and observe that your right hand be equal with your shoulder. 19. *Cast about to Charge*: Take the Fire lock with your left hand, a hands breadth from the lock, the thumb upwards, turn it about that the barrel come outwards and proceed, as in the musket. 20. *Draw forth your Bayonets*: Take your Bayonet with your right hand, draw it, and with an out stretched arm bring it before you in a right line with your shoulder, holding the Bayonet, the thumb upwards, and the flat of the blade toward your body. 21. *Screw your Bayonets in the Muzzels*: Put your Bayonet in the barrel, turning about the guard towards you, that it may lie fast, and flat, take hold of the muzzel of your Fire-lock with your right hand, the thumb upwards, thrusting it with both arms nimbly from your body. 22. *Rest your Bayonets*: Mount your Bayonets with both hands, turning at the same time, with-

without resting upon the left heel, to the right; as you face let go your right hand, and bring it under the cock, turning the barrel towards your body, then fall back hand and foot, and keep the posture shewn in resting your Musket. 23. *Charge your Bayonets:*

Bring your Bayonet nimbly up with both hands, and bringing up of your right foot, in which bringing up, you bring your right hand under, so that the butt rest on your fingers, the thumb outwards upon the butt end, fall back with your right foot, charge your Bayonet breast high, in which charging the butt end lies in a full right hand, and the thumb upon it. 24. *Cast about your Bayonets to the left side:*

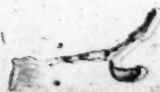
Bring up your Fire-lock straight before you, with the bringing up your right Foot; letting loose at the same time your right hand from the butt, and bring it under the cock, turn your Fire-lock with both hands, so that the barrel comes outwards; then do as in casting about the Musket. 25. *Recover your Bayonets:*

Bring your Bayonet with both hands to your body, draw it out of the barrel, hold it out with a stretched arm as before. 26. *Put up your Bayonets:*

Put your Bayonet into the Scabbard, then take hold of your Fire-lock with your right hand by the muzzle, thrusting it from you, as hath been shewn. 27. *Half cock your Fire-lock:*

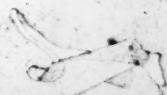
Bring your Fire-lock with both hands mounted before

fore your body, facing to the right upon the left heel, in which turning you let go your right hand, take hold of the cock with your right thumb and proceed, as in the Musket. 28. *Blow your Pans:* as with the Musket. 29. *Handle your Primers:* as in the Musket, only the muzzle held a little lower. 30. *Prime:* as with the Musket. 31. *Shut your Pan:* as with the Musket. 32. *Call about to Charge:* as with the Musket. 33. *Handle your Cartridges:* as with the Musket. 34. *Open your Cartridges:* Fringing the Cartridge to your mouth bite of the top and bring it again to its place, holding the Cartridge with the thumb upwards. 35. *Charge with your Cartridges:* Put it into the barrel, keeping your two foremost fingers on the barrel, till the next Command. 36. *Draw forth your Scourer:* as with the Musket. 37. *Shorten them to an Inch:* as with the Musket. 38. *Ram down Powder and Ball:* as with the Musket. 39. *Withdraw your Scourers:* as with the Musket. 40. *Shorten them to a handful:* as in the Musket. 41. *Return your Scourers:* as with the Musket. 42. *Poise your Fire-locks:* as with the Musket. 43. *Shoulder your Fire-locks:* as with the Musket. 44. *Rest your Fire-locks:* as with the Musket. 45. *Order your Fire-locks:* as with the Musket. 46. *Lay down your Fire lock:* as with the Musket. 47. *Quit your Fire lock:* as with the Musket. 48. *Handle your Fire lock:* as with the Musket. 49. *Order*



der your Fire-lock: as with the Mus' et. 50 *Rest*
 your Fire lock: as with the Mus' et. 51. *Club*
 your Fire locks: Keep your Fire-lock firm in
 your left hand, bring up the right foot at the
 same time that the butt-end is upwards, and
 the muzzle downwards; at once taking hold
 of it with the right hand about a foot from the
 muzzle, that the right thumb come upwards,
 and the left downwards; then let loose the left
 hand, and take hold again at the same time
 with a full left hand an inch from the muzzle,
 hold it with outstretched arms against the left
 shoulder, and bring it upon your shoulder,
 with the Lock upwards, quit your right hand
 nimbly and let it hang down by your side. 52.
Rest your Firelocks: Turn the Fire-lock with
 your left hand inwards, and at the same time
 take hold with the right above the left, the
 thumb upwards, and the elbows in a straight
 line, bring the same nimbly with both hands
 before your body, then let loose your left
 hand, sinning the right hand and Fire-lock a
 little, and taking it at the same time with the
 left hand turned, both the thumbs turned one
 against another, then loose your right hand,
 and turning the Fire-lock, bring the butt end
 down, and rest your Fire-lock. 53 *Shoulder*
 your Fire-lock: First poise your Fire-lock
 bringing up your right foot at the same time,
 then meeting it with your left, lay it on your
 shoulder.

Take



Take heed to make ready to give fire at three words of Command.

1. *Make Ready*: This is done as in the three first Explanations is shewn at large.
2. *Present*: This is done as in Explanation 4 and 5.
3. *Fire*: This is done as in Explanation 6 and 7.

Take heed to make ready to Fire, and Deliver your Granades at three words of Command.

1. *Make Ready*: This is done as is shewn from Explanation 8. to 13. Inclusive.
2. *Blow your Matches*: This is done as in Explanation 14.
3. *Fire, and Deliver your Granades*: This is done as in Explanation 15.

Take heed to make ready to use your Bayonets.

1. *Make Ready*: This is shewn as from Explanation 16. to 22. Inclusive.
2. *Charge your Bayonets*: This is done in Explanation 23.

Take heed to make ready your Fire-locks again.

Make ready your Fire-locks: This is done at large in this Exercise, from Explanation 24. to Explanation 27. Inclusive.

F I N I S.

B^QL

STEVENS (John) Captain

Fortification and military
Discipline. 1688, 89

Military discipline, or The
art of war [1685?]

Wing S 61; S 74, 75

The Epitome ^(rearranged) ~~contains~~ some
of its plates and some
of its text with the
above 2 works; but its
bibliographical status is
still in doubt; NYPL

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F I N I S.

B L

Have a similar work by
a similar title; but
it evidently differs in
major (see parts (see
correspondence).

WJ 4/76